Pesticide Research Report

Rapport de recherche sur les pesticides

Compiled by

Expert Committee on Pesticide Use in Agriculture

Préparé par

le Comité d'experts sur l'emploi des pesticides en agriculture

1987

NOTE: This report does not necessarily reflect the views of the federal or provincial departments of agriculture, the universities, other federal departments or industry.

REMARQUE: Le présent rapport ne reflète pas nécessairement les opinions des ministères fédéral et provinciaux de l'Agriculture, ni celles des universités, des autres ministères fédéraux ou du secteur industriel.

Canada

1987

PESTICIDE RESEARCH REPORT

compiled by
EXPERT COMMITTEE
ON PESTICIDE USE
IN AGRICULTURE
OTTAWA, ONTARIO
Chairman - G.A. Surgeoner
Secretary - H.S. Krehm

RAPPORT DE RECHERCHE SUR LES PESTICIDES

préparé par le
COMITE D'EXPERTS
SUR L'EMPLOI DES PESTICIDES
EN AGRICULTURE
OTTAWA (ONTARIO)
Président - G.A. Surgeoner
Secrétaire - H.S. Krehm

This report was assembled and the indexes and list of chemical definitions were prepared by the Scientific Information Retrieval Section.

Each contribution to the report has been identified by key words and indexed in a way that permits computer search.

Research Program Service
Scientific Information Retrieval Section
Research Branch
Agriculture Canada
Ottawa, Ontario
K1A 0C6

(613)995-7084 ext. 7260

Le rapport fut compilé par la Section d'information sur la recherche scientifique. Cette section fut aussi chargée de la préparation des index ainsi que de la liste des définitions des pesticides et produits chimiques.

Chaque sujet traité dans ce document a été condifié à l'aide des mots-clés et indexé de telle sorte qu'il puisse être facilement repéré par ordinateur.

Service aux programmes de recherche
Section d'information sur la recherche scientifique
Direction Générale de la recherche
Agriculture Canada
Ottawa (Ontario)
K1A 0C6
(613)995-7084 ext. 7260

©Minister of Supply and Services Canada 1987

Available in Canada through

Authorized Bookstore Agents
and other bookstores

or by mail from

Canadian Government Publishing Centre
Supply and Services Canada
Hull, Quebec, Canada K1A 0S9

Catalogue No. A41-14/1987 Price: Canada: $15.00
ISBN 0-660-53894-6 Other Countries: $18.00

Price subject to change without notice

©Ministre des Approvisionnements et Services Canada 1987

En vente au Canada par l'entremise de nos

agents libraires agréés
et autres librairies

ou par la poste au:

Centre d'édition du gouvernement du Canada
Approvisionnements et Services Canada
Hull, Québec, Canada K1A 0S9

No de catalogue A41-14/1987 au Canada: $15.00
ISBN 0-660-53894-6 à l'étranger: $18.00

Prix sujet à changement sans préavis

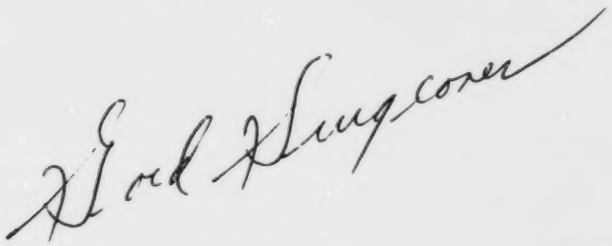
FOREWORD

The Expert Committee on Pesticide Use in Agriculture (formerly the National Committee on Pesticide Use in Agriculture and more recently the Canada Committee on Pesticide Use in Agriculture, formed in 1961 by its parent body, the National Coordinating Committee on Agricultural Services, is one of eight expert committees reporting to the Canada Committee on Crop Production which in turn is one of 6 Canada Committees reporting to Canadian Agricultural Services Coordinating Committee. It has three main duties: to define problems in crop and animal protection and to coordinate and stimulate research on pesticides (excluding herbicides); to establish principles for drafting local recommendations for pesticide use and to summarize and make available current information on pesticides.

The first meeting of the N.C.P.U.A. , held in Ottawa, March 19-21, 1962, recommended the Committee should provide an annual compilation of summaries of research reports and pertinent data on crop and animal protection involving pesticides.

This year there were 356 reports. We are indebted to the research workers for their cooperation in this field, from provincial and federal departments, as well as universities and industry, together with the section editors and members of the Scientific Information Retrieval Section for making this report possible.

You will notice that some changes have been made in this year's Research Report. Further changes are contemplated aimed at increasing standardization, earlier publication of the Report and no overall increase in volume size. We would welcome any suggestions for improvement or criticism of the present reporting format.



Chairman

E.C.P.U.A.

THIS ANNUAL REPORT IS DESIGNED TO ENCOURAGE AND FACILITATE THE RAPID DISSEMINATION OF PESTICIDE RESEARCH RESULTS AMONGST RESEARCHERS, THE PESTICIDE INDUSTRY, GOVERNMENT AGENCIES, AND OTHERS CONCERNED WITH THE DEVELOPMENT, REGISTRATION AND USE OF EFFECTIVE PESTICIDES.

IF IN DOUBT ABOUT THE REGISTRATION STATUS OF A PARTICULAR PESTICIDE, CONSULT THE PESTICIDES DIRECTORATE, FOOD PRODUCTION AND INSPECTION BRANCH, AGRICULTURE CANADA, OTTAWA, ONTARIO K1A 0C6.

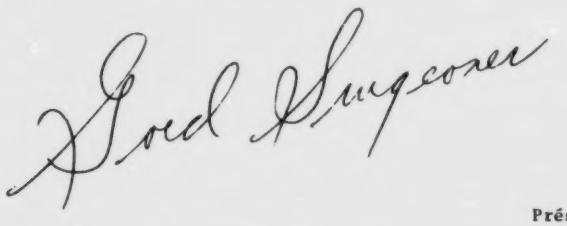
AVANT-PROPOS

Le Comité d'experts pour l'emploi des pesticides en agriculture (autrefois appelé Comité national pour l'emploi des pesticides en agriculture et plus récemment, Comité canadien pour l'emploi des pesticides en agriculture formé en 1961 par son organisme parent, le Comité de coordination des services agricoles canadiens) est l'un des huit groupes d'experts qui relèvent directement du Comité canadien des production végétales, lequel à son tour fait partie des sept comités placés sous l'autorité du Comité de coordination des services agricoles canadiens. Il assume trois fonctions principales qui sont de cerner les problèmes rencontrés au niveau de la protection des productions végétales et animales et de stimuler la recherche sur les pesticides (à l'exclusion des herbicides, d'énoncer les principes de la formulation des recommendations visant l'emploi des pesticides et de résumer puis de diffuser toute les informations disponibles sur les pesticides.

La première réunion du C.N.E.P.A. à Ottawa du 19 au 21 mars 1962, adoptait une proposition voulant que le comité compile annuellement des résumés des rapports de recherche et des données pertinentes sur la protection des productions végétales et animales au moyen des pesticides.

Ainsi, cette année, le comité a publié 356 rapports. Ses membres tiennent à remercier chaleureusement les chercheurs des ministères provinciaux et fédéraux, des universités et du secteur privé sans oublier les rédacteurs et le personnel de la Section d'information sur la recherche scientifique dont la collaboration a permis de rédiger le présent rapport.

Il est à noter que certains changements ont été apportés au rapport de recherches de cette année. D'autres changements sont envisagés dans le but de standardiser et d'accélérer la parution du rapport sans toutefois modifier sa taille. Nous aimerions connaître vos critiques ou suggestions quant au présent rapport afin d'en améliorer la présentation.



Président

C.E.E.P.A.

L'OBJECTIF POURSUIVI PAR LA PUBLICATION DU RAPPORT ANNUEL EST DE FACILITER LA DIFFUSION DES RESULTATS DE LA RECHERCHE SUR LES PESTICIDES AUPRES DES CHERCHEURS' DE L'INDUSTRIE, DES ORGANISMES GOUVERNEMENTAUX ET DE TOUTES LES PERSONNES OU GROUPES CONCERNES PAR LA FABRICATION, L'HOMOLOGATION ET L'EMPLOI DES PESTICIDES.

EN CAS DE DOUTE RELATIVEMENT A L'ENREGISTREMENT D'UN PRODUIT DONNE, CONSULTER LA DIRECTION DES PESTICIDES, DIRECTION GENERALE DE LA PRODUCTION ET DE L'INSPECTION DES ALIMENTS, AGRICULTURE CANADA, OTTAWA (ONTARIO) K1A 0C6.

TABLE OF CONTENTS

	PAGE
Insects of Fruit Crops	1
Insects of Vegetable and Special Crops	75
Insects of Cereal and Forage Crops	139
Medical and Veterinary Insects	159
Ornamental and Greenhouse Insects	167
Basic Studies on Insecticides	173
Diseases of Fruit Crops	181
Diseases of Vegetable and Special Crops	203
Diseases of Potatoes	235
Diseases of Cereal and Forage Crops	243
Diseases of Ornamentals and Greenhouse	327
Nematode Studies	341
Residue Studies	345
Stored Products	365
Basic Studies on Fungicides	367
List of Pesticides and Chemical Definitions	369
Indexes	393

TABLE DES MATIERES

	PAGE
Insectes des fruits	1
Insectes des légumes et cultures spéciales	75
Insectes des céréales et cultures fourragères	139
Insectes d'importance médicale et vétérinaire	159
Insectes des plantes ornementales et de serre	167
Etudes de base sur les insecticides	173
Maladies des fruits	181
Maladies des légumes et cultures spéciales	203
Maladies des pommes de terre	235
Maladies des céréales et cultures fourragères	243
Maladies des plantes ornementales et de serre	327
Etudes sur les nématodes	341
Etudes sur les résidus	345
Etudes sur les produits entreposés	365
Etudes de base sur les fongicides	367
Liste des pesticides et définitions chimiques	369
Index	393

Insects of Fruit Crops

Insectes des fruits

Edited by / Révisé par
A. Dyck; C. Vincent; D. J. Pree

CROP: Apple var. MacIntosh

PEST: Apple aphid, Aphis pomi (DeGeer)

TITLE: EVALUATION OF KARATE FOR THE CONTROL OF APPLE APHIDS, 1987

MATERIALS: KARATE 50 EC (PP 321 50 g ai/L), CYMBUSH 250 EC (cypermethrin 250 g ai/L), PIRIMOR 50 WP (pirmicarb 500 g ai/kg).

METHODS: Treatments were applied to 1 tree plots replicated 4 times and arranged in a randomized complete block design. A hand-held gun was used to apply the spray solution to run-off (approximately 3,000 L/ha) at a pressure of 2,100 kPa. Five leaves on ten terminals were examined for aphids and the number of leaves having >5, 1-5 and 0 aphids was was recorded. Treatments were applied on July 21 and assessments were made on July 22, 24, and 28.
Location: Mont St. Hilaire, Quebec

NAME AND AGENCY:

LETENDRE, G.
Chipman, A Business Unit of C-I-L Inc.
623 Le Breton
Longueuil, Quebec
J4G 1R9

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Twenty-four hours after treatment, no significant difference was observed in the number of leaves having greater than 5 aphids/leaf or no aphids at all. KARATE at 0.015 kg/ha provided a significant reduction in the number of leaves having 1-5 aphids/leaf. After 3 days, all treatments had significantly less leaves with populations greater than 5 and 0 aphids/leaf when compared to the untreated trees. KARATE at 0.015 kg was not significantly different to PIRIMOR in reducing the number of leaves having 1-5 aphids/leaf. At seven days, the populations present declined throughout the test site. All treatments had significantly less leaves infested with no aphids and all treatments except KARATE at 0.01 kg were significantly different to the untreated trees in the number of leaves having greater than 5 aphids /leaf.

TREATMENT	RATE (g ai/kg)	NUMBER OF LEAVES HAVING APHIDS								
		July 22 (1 day)			July 24 (3 days)			July 28 (7 days)		
		>5	1-5	0	>5	1-5	0	>5	1-5	0
KARATE 50 EC	0.0100	10.2	4.7 ab[1]	31.7	1.7 a	4.5 c	41.4 a	2.9 b	1.3	44.0 a
KARATE 50 EC	0.0125	14.2	8.4 bc	25.5	2.5 a	2.3 bc	43.8 a	1.7 a	2.5	44.4 a
KARATE 50 EC	0.0150	3.3	2.5 a	42.8	1.5 a	0.9 ab	47.2 a	1.2 a	0.9	47.5 a
CYMBUSH 250 EC	0.1000	7.6	4.0 a	37.9	0.2 a	0.2 a	49.5 a	0.4 a	0.7	48.7 a
PIRIMOR 50 WP	0.8500	7.6	3.6 a	38.1	0.0 a	0.0 a	50.0 a	0.0 a	1.3	49.0 a
Untreated	-	8.4	9.8 c	29.2	16.9 b	2.5 bc	28.1 b	7.3 b	5.4	35.4 b

1. Means followed by the same letter in the same column are not significantly different at the 5% level (t-test). Values square root transformed, constant = 0.5.

CROP: Apple cv. Red Delicious

PEST: Apple Aphid, Aphis pomi DeGeer, Woolly Apple Aphid, Eriosoma lanigerum (Hausmann)

TITLE: EVALUATION OF INSECTICIDES FOR CONTROL OF APPLE APHIDS.

NAME AND AGENCY:
MARSHALL, D.B. and PREE, D.J.
Agriculture Canada, Research Station
VINELAND STATION, Ontario LOR 2EO

MATERIALS: METASYSTOX-R 240 g a.i./L SC (oxydemeton-methyl), PIRIMOR 50 WP (pirimicarb), KARATE 50 g a.i./L EC (lambda cyhalothrin), CYTHION RTU 46.2% (malathion), MALATHION 47% EC (malathion), BRIGADE 10% WP (bifenthrin).

METHODS: Plots were replicated four times in a twenty-three-year-old block of Red Delicious on MVII rootstock with tree spacing of 8.2 m by 8.2 m. Treatments were arranged according to a randomized complete block design and assigned to single-tree plots. Materials were diluted to a concentration comparable to 3370 L of water per ha and applied using a truck-mounted sprayer equipped with a Spraying Systems handgun fitted with a D-6 orifice plate. Pressure was set at 1370 kPa. Plots were sampled (prespray) July 21 when twenty-five terminals in the top half of the tree canopy were examined and rated for apple aphid (AA). A rating system of 0 to 5 (5 for heavily infested terminals) was established. The numbers of woolly apple aphid (WAA) colonies on each of four scaffold limbs/plot in 1-m distance in each limb were counted and recorded. Plots were sprayed to runoff (14-16 L/plot) on July 22. Plots were again sampled July 29 when terminals in the top half of the tree canopy were repeated for AA and scaffold limbs examined for living WAA colonies. WAA colonies were considered living when 'wool-covered' immature aphids were present. Data were analysed using an analysis of variance and Duncan's multiple range test.

RESULTS: As presented in the table below.

CONCLUSIONS: There were no significant differences between plots prespray. All materials statistically reduced AA ratings compared to the untreated control plots by July 29. METASYSTOX-R and PIRIMOR treated plots had significantly lower ratings than all other treatments. MALATHION performed as well as CYTHION R.T.U. against AA; both treatments had ratings of 2.1. All plots except those treated with BRIGADE significantly reduced numbers of WAA colonies compared to the untreated control. However, numbers of WAA colonies were not significantly higher in BRIGADE-treated plots than in plots treated with other pesticides.

Treatment (July 22)	Rate g a.i./ha	AA Rating July 21	AA Rating July 29	WAA colonies/4 scaffold limbs July 21	WAA colonies/4 scaffold limbs July 29
METASYSTOX - R 240 SC	1400.0	3.6 a[1]	0.6 a	4.8 a	2.3 a
PIRIMOR 50 WP	850.0	3.3 a	0.7 a	5.3 a	2.0 a
KARATE 50 EC	12.5	3.3 a	1.6 b	2.3 a	2.0 a
MALATHION 47% EC	4212.5	3.5 a	2.1 b	2.5 a	1.8 a
CYTHION R.T.U. 46.2%	4212.5	3.3 a	2.1 b	5.0 a	1.5 a
BRIGADE 10 WP	25.0	3.3 a	3.0 c	4.5 a	3.5 ab
CONTROL	--	3.1 a	4.1 d	5.3 a	5.5 b

[1] means followed by the same letter not significantly different ($P < 0.05$, Duncan's multiple range test).

CROP: Apple var. Red Delicious

PEST: Apple brown bug (ABB), Atractotomus mali (Meyer), mullein bug (MB), Campylomma verbasci (Meyer)

TITLE: 1987 EVALUATION OF INSECTICIDES APPLIED AT LATE CALYX AGAINST FRUIT-STINGING MIRIDS

MATERIALS: GUTHION 35 WP (azinphos-methyl), GUTHION 360 F (azinphos-methyl), CYMBUSH 12.5 WP (cypermethrin), DECIS 2.5 EC (deltamethrin), POUNCE 384 EC (permethrin), DIPEL WP (Bacillus thuringiensis var. kurstaki Berliner), HOE 000522 15 F (teflubenzuron), ALSYSTIN 480 F (triflumuron), CYGON 480 EC (dimethoate), BRIGADE 10 WP (bifentin), KARATE 50 EC (cyhalothrin), DIMILIN 25 WP (diflubenzuron), CAPTAN 50 WP (captan), RIPCORD 400 EC (cypermethrin), SEVIN 50 WP (carbaryl), MALATHION 25 WP.

METHODS: Treatments were applied to two tree plots with a hand-held gun at a pressure of 2800 kPa to runoff, 17 June.

NAME AND AGENCY:
HARDMAN, John Michael
Agriculture Canada, Research Station
Kentville, N. S. B4N 1J5

Densities of ABB and MB (2 trees per treatment) were estimated using a 1 metre square tapping tray 18 and 22 June. Estimates of insect injury to fruit were based on examination of 100 apples per tree (2 trees per treatment) 13 October 1987.

RESULTS: The results are summarized in the table below.

CONCLUSIONS: There was not a close correlation between the number of ABB and MB caught in the tapping tray samples and the percentage of fruit with mirid stings. Some materials, such as CYGON and some of the synthetic pyrethroids, caused a sudden drop in the tapping tray count of mirids, yet fruit injury levels were very close to the 17% level observed in the check trees. In contrast, MALATHION and SEVIN had a less dramatic effect on the tapping tray counts, but fruit injury levels in these treatments were 11% lower than in the check plot.

Treatment[1]	Rate /100 L	No. of mirids in tapping tray 18 June ABB	18 June MB	22 June ABB	22 June MB	Percentage of fruit stung by ABB and MB[2]
GUTHION 35 WP	50.0 g	9	1	7	0	17.0ab
GUTHION 360 F	50.0 ml	82	1	24	2	19.2ab
CYMBUSH 12.5 WP + DIPEL WP	1.7 g 16.0 g	0	0	0	1	18.5ab
DECIS 2.5 EC	10.0 ml	2	0	1	0	14.8ab
POUNCE 384 EC	7.9 ml	0	0	0	0	11.0ab
POUNCE 384 EC +DIPEL WP	1.6 ml 16.0 g	0	1	0	0	20.5 ab
HOE 000522 15 F	24.0 ml	105	0	70	2	38.0a
ALSYSTIN 480 F	31.0 ml	125	0	67	1	42.0a
DIMILIN 25 WP	40.0 g	46	2	5	2	9.8ab
CYGON 480 EC	31.0 ml	0	0	0	0	15.9ab
BRIGADE 10 WP	7.6 g	0	0	0	0	10.2ab
KARATE 50 EC	0.8 ml	0	0	0	0	18.2ab
RIPCORD 400 EC +DIPEL WP	0.4 ml 16.0 g	0	0	0	0	20.0ab
MALATHION 25 WP	12.5 g	31	1	16	2	5.4b
MALATHION 25 WP	6.3 g	25	0	10	1	5.2b
SEVIN 50 WP	50.0 g	22	0	1	0	5.4b
Check		81	1	60	1	17.0ab

[1]Each mixture with DIPEL included 200 g CAPTAN 50 WP/100 L because of the spreader/sticker included in the formulation.

[2]Means in the same column followed by the same letter are not significantly different ($P>0.05$) according to Tukey's Studentized range test after arc sine transformation of the data.

CROP: Apple var. Red Delicious

PEST: Apple brown bug (ABB), Atractotomus mali (Meyer), mullein bug (MB), Campylomma verbasci(Meyer), European red mite (ERM), Panonychus ulmi Koch, apple rust mite (ARM), Aculus schlechtendali (Nalepa), Typhlodromus species (TP).

TITLE: 1987 IMPACT OF INSECTICIDES APPLIED AT LATE CALYX AGAINST FRUIT-STINGING MIRIDS ON MITES AND LEVELS OF LEAF BRONZING.

MATERIALS: GUTHION 35 WP (azinphos-methyl), GUTHION 360 F (azinphos-methyl), CYMBUSH 12.5 WP (cypermethrin), DECIS 2.5 EC (deltamethrin), POUNCE 384 EC (permethrin), DIPEL WP (Bacillus thuringiensis var. kurstaki (Berliner), HOE 000522 15 F (teflubenzuron), ALSYSTIN 480 F (triflumuron), CYGON 480 EC (dimethoate), BRIGADE 10 WP (bifentin), KARATE 50 EC (cyhalothrin), DIMILIN 25 WP (diflubenzuron), CAPTAN 50 WP (captan), RIPCORD 400 EC (cypermethrin), SEVIN 50 WP (carbaryl), MALATHION 25 WP.

METHODS: Treatments for ABB and MB were applied to two tree plots with a hand-held gun at a pressure of 2800 kPa to runoff, 17 June. Samples of 4 clusters per tree (2 trees per treatment) were taken 2 September. Leaves were brushed and counted and mite densities were estimated on a per leaf basis. Levels of

(lower leaf surface) were estimated 4 September

NAME AND AGENCY:
HARDMAN, John Michael
Agriculture Canada, Research Station
Kentville, Nova Scotia B4N 1J5

by direct observation in the orchard. Levels of bronzing were: 1 - very light, with no bronzing apparent; 2 - light, a few leaves with yellowing on the upper surface (ERM) or localized bronzing on the lower surface (ARM); 3 - light to moderate bronzing, with most limbs having a number of bronzed leaves; 4 - moderate bronzing, with many leaves at least slightly bronzed; 5 - moderate to heavy bronzing, with most of the canopy off-colour; and 6 - heavy bronzing throughout the tree. Levels 5 and 6 are considered severe enough to cause economic losses.

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Counts of ERM in the check trees were higher than in many of the treated trees where bronzing was severe enough to cause a decline in mite numbers. Typhlodromid predators were found in the GUTHION, CYMBUSH + DIPEL, POUNCE, POUNCE + DIPEL, HOE, ALSYSTIN, CYGON, and MALATHION plots. Levels of ERM or ARM bronzing were at economic levels (5 or 6) in the plots where SEVIN, the organophosphates, and the synthetic pyrethroids (exceptions: KARATE, RIPCORD) were applied. Bronzing was at lower levels in the KARATE, RIPCORD + DIPEL, HOE 000522, ALSYSTIN, DIMILIN and check plots.

Treatment	/100 L	No. of mites per leaf 2 September		Level of bronzing caused by	
		ERM	TP	ERM	ARM
GUTHION 35 WP	50.0 g	1.4bcd	0.0a	4.0a	5.0abc
GUTHION 360 F	50.0 ml	0.8cd	0.3a	5.0a	4.5ab
CYMBUSH 12.5 WP	1.7 g	9.7abcd	0.9a	5.5a	5.0a
+ DIPEL WP	16.0 g				
DECIS 2.5 EC	10.0 ml	7.8abcd	0.0a	5.0a	4.0abc
POUNCE 384 EC	7.9 ml	0.6d	2.0a	5.0a	5.0a
POUNCE 384 EC	1.6 ml	1.5bcd	0.7a	5.0a	5.0a
+ DIPEL WP	16.0 g				
HOE 000522 15 F	24.0 ml	7.0bcd	0.3a	2.0a	2.0c
ALSYSTIN 480 F	31.0 ml	1.8bcd	0.9a	2.0a	2.5bc
DIMILIN 25 WP	40.0 g	2.4bcd	0.0a	4.0a	4.0abc
CYGON 480 EC	31.0 ml	16.1ab	0.6a	3.5a	5.0a
BRIGADE 10 WP	7.6 g	14.3abc	0.0a	3.5a	5.0a
KARATE 50 EC	0.8 ml	1.0cd	0.0a	3.5a	3.5abc
RIPCORD 400 EC	0.4 ml	2.9bcd	0.0a	4.0a	3.5ab
+ DIPEL WP	16.0 g				
MALATHION 25 WP	12.5 g	15.6ab	0.0a	5.5a	4.5ab
MALATHION 25 WP	6.3 g	7.3bcd	0.6a	5.0a	4.5ab
SEVIN 50 WP	50.0 g	10.9abcd	0.0a	5.5a	5.5a
Check		30.2a	0.0a	2.5a	3.5abc

1. Each mixture with DIPEL included 200 g CAPTAN 50 WP/100 L because of the spreader/sticker included in the formulation.

Means in the same column followed by the same letter are not significantly different ($P>0.05$) according to Tukey's Studentized range test after arc sine transformation of the data.

CROP: Apple

PEST: Codling moth, Cydia pomonella (Linnaeus)

TITLE: RELATIVE EFFECTIVENESS OF THE CODLING MOTH GRANULOSIS VIRUS AND THE IMPACT OF THE VIRUS ON NONTARGET APPLE ORCHARD FAUNA.

MATERIALS: CARPOVIRUSINE $5x10^{10}$ GIB/g WP (codling moth granulosis virus), GUTHION 50 WP (azinphos-methyl).

METHODS: Tests were conducted in a .25 ha planting of Spartan trees. Test materials were each applied to 16-23 trees in a randomized complete block design. The CARPOVIRUSINE and the GUTHION were applied using a hand gun at the rates of 40 g/90 L and 140 g/90 L respectively. Sprays were first applied May 24. Subsequent CARPOVIRUSINE sprays were applied June 4, 17, 30, July 10 and August 4 and 19. GUTHION sprays were applied June 4, 30 and August 4. To assess the impact of the 2 treatments on nontarget organisms, limbtaps were performed on 5 of the central trees in each treatment and the control before each spray application. To assess the effectiveness of the treatments for codling moth control, a visual count of codling moth stings was made on 100 apples on each of 5 central trees in each treatment July 31. All apples harvested from the central trees in each treatment were assessed for codling moth as well as budmoth damage.

NAME AND AGENCY:
COSSENTINE, J.E. and JENSEN, L.B.M.
Agriculture Canada
Research Station
Summerland, British Columbia V0H 1Z0

RESULTS: A) Impact on nontarget organisms: Arthropods assessed in the limbtaps included: Campylomma, 2 species of thrips, leafhoppers, apple grain aphids, woolly apple aphids, Hymenoptera, fruitworms, ladybird beetles, syrphids, midges, lacewings, spiders, mirids and leafrollers. In the few instances where there were significantly ($P < .05$) different numbers recorded between the treatments and/or the control, the differences did not persist through the summer except for the persistently higher numbers of leafhoppers in the GUTHION treated trees. Only the GUTHION significantly ($P < .05$) reduced the amount of budmoth damage observed at harvest compared to that in the CARPOVIROSINE and control blocks.

B) Effectiveness of CARPOVIRUSINE: The assessment of codling moth stings in July found very few damaged apples and no significant ($P = .05$) difference in damage levels between the two treatments and the control. At harvest, the percentage of codling moth damage assessed in the CARPOVIRUSINE (0.5) and the GUTHION (0.1) treated blocks was significantly ($P < .05$) less than that observed in the control (2.5) blocks.

CONCLUSION: The CARPOVIRUSINE appears to be an effective codling moth control with no apparent detrimental impact on the nontarget apple orchard fauna assessed in this study.

CROP: Apple

PEST: Codling moth, Cydia pomonella (L.)

TITLE: EVALUATION OF DIMILIN, RO-13-5223 AND HOE-00522 FOR CONTROL OF CODLING MOTH.

MATERIALS: DIMILIN 25WP (diflubenzuron), RO-13-5223 25WP (fenoxycarb), HOE-00522 F 150 g ai/L (teflubenzuron), GUTHION 50WP (azinphos-methyl).

METHODS: Treatments were applied to single-tree plots of mature McIntosh, Newtown or Red Rome apple trees spaced at 2.3 x 4.6 m. Each treatment was applied to each variety at least once. Plots were replicated 4 times in a randomized complete block design. At least one guard tree separated adjacent plots within rows. A high-volume application was made using a hand-held gun sprayer at a pressure of 1,380 kPa to run-off. Spraying was timed by a degree-day program to occur at the beginning of moth emergence (May 27 and July 26) and the beginning of egg hatch (June 3 and August 2) (with repeat sprays after 3 weeks). After harvest in late September to mid-October, all apples from each plot were inspected for codling moth damage. Data were transformed using $\sqrt{x + 0.5}$. On October 10, 25 leaves/tree were collected and brushed, and predacious mites counted.

NAME AND AGENCY:
DYCK, V.A.
Agriculture Canada Research Station
Summerland, British Columbia V0H 1Z0

RESULTS: See table below.

CONCLUSIONS: All treatments achieved significant control of the codling moth, but further tests are needed to determine if commercial control can be achieved with DIMILIN at high pest densities. Very few predacious mites were found on leaves from untreated trees.

Treatment	Rate (g ai/100 L)	Application date (day/month) First brood		Second brood		Damaged apples at harvest (%)
DIMILIN	10.0	27/5	17/6	26/7	23/8	1.1 b[1]
DIMILIN	4.7	27/5	17/6	26/7	23/8	3.0 b
RO-13-5223	27.5	27/5	17/6	26/7	23/8	0.2 b
RO-13-5223	2.8	27/5	17/6	26/7	23/8	0.4 b
HOE-00522	7.9	27/5	17/6	26/7	23/8	0.2 b
HOE-00522	4.0	27/5	17/6	26/7	23/8	0.5 b
GUTHION	18.5	3/6	24/6	2/8	13/9	0.0 b
Untreated A	-					12.2 a
Untreated B	-					13.5 a

[1] Means followed by the same letter are not significantly different (LSD, P = 0.05).

CROP: Apple var. McIntosh

PEST: Codling moth (CM), Cydia pomonella (L).

TITLE: 1987 EVALUATION OF GRANULOSIS VIRUS AND VIRUS/GUTHION MIXTURE FOR CODLING MOTH CONTROL.

MATERIALS: GUTHION 50 WP (azinphos-methyl), AGRAL 90 (90% nonyl phenoxy polyethoxy ethanol) a spreader/sticker, codling moth granulosis virus (CMGV) with 5×10^{10} granulosis inclusion bodies per gram.

METHODS: Plots were located along 2 adjacent rows of 3 m tall, 6 year old McIntosh planted on a 4.5 X 6.5 m spacing. Plots consisted of 2 parallel rows of 8 trees. There was one check plot halfway down the rows and two plots each (one north and one south of the check) for the virus and the virus/GUTHION mixture. Treatments were applied 30 June and 13 July to the 16 tree plots with a hand-held gun at a pressure of 2800 kPa to runoff. Each treatment and the check included a spreader sticker (38 mL/100 L) that was necessary to ensure thorough coverage of the foliage with virus and powdered skim milk (500 g/100 L) to protect the virus from ultraviolet rays. Samples of 100 apples on each tree were examined 23 September and the number with CM oviposition stings and with CM deep entries were recorded. Records were also taken of the number of drop apples associated with each tree, and the percentage of drop apples that had CM damage (either oviposition stings or deep entries).

NAME AND AGENCY:
HARDMAN, John Michael
Agriculture Canada Research Station
Kentville, Nova Scotia B4N 1J5

RESULTS: The results are summarized in the tables below.

CONCLUSIONS: When fruit still on the tree were examined, there was no difference in the percentage of fruit with CM injury between the treated plots and the check. However, both the virus plots and the virus/GUTHION plots had fewer drop apples per tree than the check plot. The virus plots and the virus/GUTHION plots also had a lower percentage of CM injury among the drop apples than did the check plot.

Treatment[1]	Rate /100 L	Percent of fruit on trees with CM injury[2]		No. of drop apples per tree[2]	Percent of drop apples with CM injury[2]
		stings	Deep entries		
CMGV[3]	12.1 g	1.25 a	0.54 a	25.10 b	10.56 b
CMGV + GUTHION	6.1 g 20.0 g	0.85 a	0.31 a	19.87 b	5.31 b
Check		1.10 a	0.92 a	94.33 a	72.98 a

1 Each treatment, including the check, had 38 mL spreader sticker/ 100 L plus 500 g powdered skim milk/100 L.

2 Means in the same column followed by the same letter are not significantly different (P>0.05) according to Tukey's Studentized range test after square root transformation of the data.

3 CMGV- codling moth granulosis virus.

CROP: Apple cv. Golden Delicious

PESTS: European red mite, Panonychus ulmi (Koch), apple rust mite, Aculus schlechtendali (Nalepa)

PREDATOR: Typhlodromus occidentalis Nesbitt

TITLE: CONTROL OF EUROPEAN RED MITE WITH EARLY AND MID-SEASON MITICIDE APPLICATIONS.

MATERIALS: ABG-6228 50 WP (thuringiensin), APOLLO 420 SC (clofentezine), KARATE 50 EC (cyhalothrin), MORESTAN 25 WP (chinomethionat), SAVEY 50 DF (DPX-Y5893).

METHODS: A planting of 25-year-old Golden Delicious apple trees on Malling VII rootstock and planted 2.25 x 4.5 m was used in a randomized block experimental design. Each treatment was applied to 3 plots of 5 trees/plot. Guard rows were left between treatment rows and 1 guard tree was left between adjacent plots within rows. MORESTAN (3.25 kg/ha) and KARATE (30 g ai/ha) were applied at the pink bud stage on 87.04.21 while the remaining materials (ABG-6228 at 99.4 g ai/ha, APOLLO at 300 ml/ha, SAVEY at 75 g ai/ha) were applied on 87.07.21. All applications were made using a hydraulic boom sprayer operating at 1.9 km/h and set to deliver 2509 L/ha. Control plots were left untreated. Mites were sampled every two weeks by brushing 10 leaves/tree from all three of the plots for each treatment.

NAME AND AGENCY:
ANGERILLI, N.P.D. and FITZGIBBON, F.
Agriculture Canada
Research Station
Summerland, British Columbia V0H 1Z0

RESULTS: See table below.

CONCLUSIONS: All of the miticides tested were effective at limiting European red mite numbers in an orchard with relatively low mite pressure. KARATE and ABG-6228 appear to be rather toxic to the predacious mite, T. occidentalis.

	Mean number per 50 leaves*				
	European red mite			Typhlodromus	
Material and Sample Date	Active	Egg	Rust mite	Active	Eggs
87.06.08					
Control	3.3 a	11.7 bc**	366 ab	3.3 ab	2.7 ab
KARATE	2.7 a	22.3 ab	59 b	0 b	0 b
MORESTAN	0 a	1.7 c	160 ab	10.0 a	8.6 a
87.08.10					
Control	10.2 ab**	354.0 ab	4 a	32.0 a	18.0 a
SAVEY	0 c	230.7 a	1 a	18.7 a	12.0 a
APOLLO	0 c	100.7 abc	2 a	17.3 a	11.3 a
KARATE	36.3 a	267.3 a	1 a	20.7 a	8.0 ab
MORESTAN	3.5 bc	91.3 bc	2 a	31.3 a	22.0 a
ABG-6228	6.7 abc	24.0 c	57 b	8.0 a	0.0 b
87.08.24					
Control	2.5 abc	128.0 ab	0 a	32.7 a	7.5 b**
SAVEY	0 c	57.3 ab	1 a	23.3 ab	9.6 ab
APOLLO	1.3 bc	28.0 b	9 a	45.3 a	5.7 b
KARATE	25.3 a	400.3 a	1 a	24.0 ab	9.1 ab
MORESTAN	1.7 bc	136.0 ab	0 a	66.0 a	54.2 a
ABG-6228	9.3 ab	266.0 a	821 b	4.0 b	1.3 b

* Data transformed to Log (x + 1) prior to analysis. Means followed by the same letter within dates and columns are not significantly different (LSD, p = 0.05).

** This column of numbers is a monotone back-transformation of the log-transformed data.

CROP: Apple cv. Red Delicious

PESTS: European red mite, Panonychus ulmi (Koch), apple rust mite, Aculus schlechtendali (Nalepa)

PREDATOR: Typhlodromus occidentalis Nesbitt

TITLE: CONTROL OF EUROPEAN RED MITE WITH EARLY SEASON MITICIDE APPLICATIONS.

MATERIALS: ABG-6162A 1.5% (thuringiensin), APOLLO 420 SC (clofentezine), BASUDIN 50 WP (diazinon), KARATE 50 EC (cyhalothrin), SAVEY 50 DF (DPX-Y5893).

METHODS: A planting of 25-year-old Red Delicious apple trees on Malling VII rootstock and planted 2.25 x 4.5 m was used in a randomized block experimental design. Each treatment was applied to 3 plots of 5 trees/plot. Guard rows were left between treatment rows and 1 guard tree was left between adjacent plots within rows. ABG-6162A (99.4 g ai/ha) was applied on 87.05.27 while the remaining materials (APOLLO at 300 ml/ha, BASUDIN at 4.5 kg/ha, KARATE at 30 g ai/ha, SAVEY at 75 g ai/ha) were applied at petal-fall on 87.05.09. APOLLO and SAVEY were applied alone and in combination with BASUDIN to check for interaction between the two materials. All applications were made using a hydraulic boom sprayer operating at 1.9 km/h and set to deliver 2509 L/ha. Control plots were left untreated. Mites were sampled every two weeks by brushing 10 leaves/tree from all three of the plots for each treatment.

NAME AND AGENCY:
ANGERILLI, N.P.D. and FITZGIBBON, F.
Agriculture Canada
Research Station
Summerland, British Columbia V0H 1Z0

RESULTS: See table below.

CONCLUSIONS: All of these miticides and miticide/insecticide combinations gave acceptable control of both European red mite and apple rust mite by Okanagan Valley standards. The miticidal performance of APOLLO and SAVEY was not affected by the addition of BASUDIN to the tank and could be applied simultaneously with BASUDIN at petal-fall to facilitate control of various species of apple-feeding lepidoptera, San Jose scale and mullein bug in addition to phytophagous mites. ABG-6162A and KARATE, as used in this test, appear to be very toxic to the phytoseiid T. occidentalis and would not fit well into current integrated mite control programs.

	Mean number per 50 leaves*				
	European red mite			Typhlodromus	
Material and Sample Date	Active	Egg	Rust mite	Active	Eggs
87.06.01					
Control	5.3 a	402.7 a	194.7 bc	2.0 ab	0.4 c**
ABG-6162A	not sampled				
SAVEY	4.7 a	144.0 a	46.0 b	10.0 ab	1.1 c
APOLLO	1.3 a	280.7 a	4.7 cd	10.0 ab	2.5 bc
KARATE	98.7 a	592.7 a	30.7 bc	0 b	0 c
BASUDIN	15.3 a	117.3 a	229.3 ab	6.0 ab	12.3 ab
APOLLO/BASUDIN	11.3 a	211.3 a	1.3 d	1.3 ab	1.1 bc
SAVEY/BASUDIN	21.3 a	261.3 a	436.7 a	9.3 a	50.1 a
87.07.06					
Control	60.4 a**	471.5 a**	1000.7 bc	28.0 ab	19.3 ab
ABG-6162A	46.7 ab	332.2 ab	3378.7 ab	2.0 c	0 c
SAVEY	3.9 ab	26.7 b	5783.3 a	47.0 a	24.7 a
APOLLO	15.9 ab	109.1 ab	23.3 d	10.7 ab	2.7 bc
KARATE	42.4 ab	401.4 a	3773.3 ab	0.7 c	0 c
BASUDIN	20.3 ab	148.1 ab	114.0 c	26.7 a	23.3 a
APOLLO/BASUDIN	2.6 b	133.3 ab	626.7 c	8.7 bc	18.7 ab
SAVEY/BASUDIN	10.4 ab	55.6 ab	4962.7 a	39.3 a	36.7 a
87.08.04					
Control	50.0 ab	606.7 a	2.4 bc	20.7 ab	16.8 abc
ABG-6162A	120.3 a	760.0 a	143.9 a	5.3 c	5.5 bcd
SAVEY	11.0 b	66.3 b	0 c	53.3 a	29.9 a
APOLLO	36.0 ab	106.0 ab	11.6 ab	36.0 ab	11.9 abcd
KARATE	58.0 ab	822.7 a	3.3 bc	0 d	1.9 d
BASUDIN	39.3 ab	133.3 ab	0 c	16.0 b	4.2 cd
APOLLO/BASUDIN	20.0 ab	158.0 ab	17.7 ab	48.7 ab	26.3 abcd
SAVEY/BASUDIN	13.3 b	42.7 b	6.5 bc	49.3 a	32.1 a

* Data transformed to Log (x + 1) prior to analysis. Means followed by the same letter within dates and columns are not significantly different (LSD, p = 0.05).

** This column of numbers is a monotone back-transformation of the log-transformed data.

CROP: Apple var. McIntosh

PEST: European Red Mite, Panonychus ulmi (Koch), McDaniel spider mite, Tetranychus mcdanieli McG., Phytoseiid mite, Typhlodromus Occidentalis Nesbitt

TITLE: EVALUATION OF DPX-Y5393 TREATMENT FOR CONTROL OF MITE PESTS OF APPLES, 1987.

MATERIALS: DPX-Y5893 50% WP (SAVEY, hexythiazox).

METHODS: Treatments were applied to single-tree plots with a hand-held gun at a pressure of 2587.5 kPa. Plots were replicated four times in a completely randomized design. DPX-Y5893 was applied at 60, 100 and 150 g ai/ha at a threshold level of approximately one motile mite/leaf (June 7, 1987). Trees were inspected for the presence of Panonychus ulmi, Tetranychus mcdanieli and the predacious mite Typhlodromus occidentalis, every 14 days. Mites were removed from a 25-leaf sample/plot using a brushing machine and counted under a binocular microscope.
Location: Kelowna, B.C.

NAME AND AGENCY:
DUMAINE, L.C. J.G. HATFIELD
DU PONT CANADA AGRICULTURAL PRODUCTS
BOX 2300 STREETSVILLE, MISSISSAUGA
ONTARIO L5M 2J4

RESULTS: The results are summarized in the table below.

CONCLUSIONS: SAVEY seemed to have no significant effect on motile populations of McDaniel mite nor Phytoseiid mite. Motile populations of European red mite (ERM) were significantly lower in all treatments of SAVEY at both post-application evaluations, when compared to the checks. On the final evaluation date, egg populations of ERM were significantly lower in the SAVEY treatments versus the checks.

			COUNTS PER 25 LEAF SAMPLE			
			EUROPEAN RED MITE		McDANIEL MITE	PHYTOSEIID MITE
EVALUATION DATE	TREATMENT	RATE g ai/ha	MOTILE FORMS	EGGS	MOTILE FORMS	MOTILE FORMS
May 29 1987	DPX-Y5893	50	11.8 a*	199.0 ab	0 a	0.3 a
	DPX-Y5893	100	15.5 a	230.3 ab	0 a	0 a
	DPX-Y5893	150	20.0 a	288.8 b	0 a	0 a
	Untreated	-	16.0 a	90.3 a	0 a	0 a
	Untreated	-	34.5 a	110.3 a	0 a	0 a
	LSD		(23.0)	(158.9)		(0.3)
June 19 1987	DPX-Y5893	50	3.0 a	327.5 ab	0.3 ab	2.0 a
	DPX-Y5893	100	3.3 a	258.5 ab	0.3 ab	1.0 a
	DPX-Y5893	150	5.0 a	19.50 a	0 a	0.3 a
	Untreated	-	20.8 b	584.0 c	0.3 ab	0.3 a
	Untreated	-	29.5 b	434.3 bc	1.0 b	0.3 a
	LSD		(12.1)	(223.7)	(0.9)	(1.7)
July 22 1987	DPX-Y5893	50	29.8 a	126.3 a	0.5 a	7.0 a
	DPX-Y5893	100	15.3 a	139.0 a	0.5 a	2.5 a
	DPX-Y5893	150	12.5 a	223.0 a	0.3 a	3.8 a
	Untreated	-	326.5 b	650.3 b	21.0 a	5.3 a
	Untreated	-	231.8 b	529.3 b	12.8 a	10.0 a
	LSD		(164.5)	(274.0)	(22.3)	(12.0)

Application Date was - June 7, 1987.

* Treatment means in the same column followed by the same letter are not significantly different at the 5% level (LSD.05)

CROP: Apple var. Red Delicious

PEST: European red mite, Panonychus ulmi (Koch)

TITLE: EVALUATION OF SAVEY AND AP[illegible]O, ALONE AND IN COMBINATION WITH PLICTRAN.

MATERIALS: PLICTRAN 50% WP (cyhexatin), SAVEY 50% WP (hexythiazox) and APOLLO 50% SC (clofentezine).

METHODS: Treatments were applied to single-tree plots with a hand-held gun at a pressure of 1379 kPa with a D_6 orifice nozzle to runoff (approximately 4,000 L/ha). Plots were replicated 4 times in a randomized complete block design. APOLLO and SAVEY alone, were applied on May 21, at calyx and PLICTRAN and PLICTRAN in combination with APOLLO and SAVEY were applied on June 11, when the apples were 10 cm in diameter. Plants were sampled prior to treatment and at one week intervals after treatment. 25 leaves/tree were randomly picked and the eggs and adult mites were brushed off and counted with aid of a microscope.

NAME AND AGENCY: ENTZ, P. J., BRAUNBERGER, P.G., and THOMSON, D.A.
Dow Chemical Canada Inc., P.O. Box 1020
Modeland Road, Sarnia, Ontario N7T 7K7

RESULTS: The results are summarized in the table below.

CONCLUSIONS: SAVEY, SAVEY + PLICTRAN and APOLLO + PLICTRAN resulted in the economic control of adult European red mite throughout the season. On July 27, the APOLLO treatment required an application of PLICTRAN to control the adult mite population. PLICTRAN alone resulted in a three-week economic control of the adult mite population. On July 06, all treatments resulted in greater mite egg control when compared to the untreated check.

		EUROPEAN RED MITE COUNTS/LEAF									
		May 25		June 15		July 06		July 27		August 10	
TREATMENT	RATE/100 L	E[1]	M[2]	E	M	E	M	E	M	E	M
APOLLO 50% SC*	16 ml	13.4a[3]	0.2a	17.0b	0.4b	29.7bc	1.9c	31.8a	11.1a	22.5a	3.0a
SAVEY 50% WP	9 g	13.0a	0.2a	13.8b	0.3b	13.3c	0.5c	13.8a	1.5a	12.0a	1.3a
APOLLO 50% SC + PLICTRAN 50% WP	16 ml 30 g	-	-	23.3a	0.9b	31.1bc	1.2c	23.6a	2.2a	25.9a	1.1a
SAVEY 50% WP + PLICTRAN 50% WP	9 g 30 g	-	-	34.2a	0.8b	32.1bc	0.5c	21.6a	1.3a	27.2a	1.0a
PLICTRAN 50% WP**	30 g	-	-	39.7a	1.1b	53.5b	8.8b	-	-	-	-
UNTREATED **	- -	16.2a	0.8a	39.1a	3.0a	123.0a	35.3a	-	-	-	-

*On July 27, applied PLICTRAN at 30 g/100 L.
**Counts were completed when the population of adults reached greater than 5-7 mites/leaf and the treatments were sprayed with CARZOL at recommended rates.
[1]Eggs
[2]Motiles
[3]Treatment means in the same column followed by the same letter are not significantly different at alpha = 0.05 (LSD).

CROP: Apple var. McIntosh

PEST: European red mite, Panonychus ulmi (Koch)

TITLE: EVALUATION OF SAVEY AND APOLLO, ALONE AND IN COMBINATION WITH PLICTRAN.

MATERIALS: PLICTRAN 50% WP (cyhexatin), APOLLO 50% SC (clofentezine)and SAVEY 50% WP (hexythiazox).

METHODS: Treatments were applied to single-tree plots with a hand-held gun at a pressure of 2069 kPa with a D_6 orifice nozzle to runoff (approximately 4,000 L/ha). Plots were replicated 4 times in a randomized complete block design. APOLLO and SAVEY treatments were applied on May 21, at 15 cm new growth. PLICTRAN and PLICTRAN in combination with APOLLO and SAVEY treatments were applied on July 17, when the apples were 3.8 cm in diameter. Plants were sampled prior to treatment and at one week intervals after treatment. Twenty five leaves/tree were randomly picked and the eggs of the adult mites were brushed off and counted with the aid of a microscope.

NAME AND AGENCY: ENTZ, P.J., BRAUNBERGER, P.G., and THOMSON, D.A.
Dow Chemical Canada Inc., P.O. Box 1012
Modeland Road, Sarnia, Ontario N7T 7K7

RESULTS: The results are summarized in the table below.

CONCLUSIONS: SAVEY, SAVEY + PLICTRAN and APOLLO + PLICTRAN resulted in the economic control of adult European mite throughout the season. These treatments also resulted in a reduction of European red mite eggs, when compared with the untreated check. Differences did not become evident until 4 weeks after treatment. There were no differences noticed between the treatments.

		EUROPEAN RED MITE COUNTS/LEAF							
		June 15		July 20		July 27		Aug 11	
TREATMENT	RATE/100 L	E[1]	M[2]	E	M	E	M	E	M
APOLLO 50% SC	16 ml	13.7a*	0.19a	22.9b	1.9b	15.6b	2.0c	13.3b	0.7b
SAVEY 50% WP	9 g	17.1a	0.38a	26.7b	1.9b	18.3b	1.7c	15.4b	1.2b
APOLLO 50% SC + PLICTRAN 50% WP	16 ml 30 g	-	-	30.1b	3.1b	16.6b	1.7c	14.0b	0.4b
SAVEY 50% WP + PLICTRAN 50% WP	9 g 30 g	-	-	38.3ab	3.8b	18.6b	1.4c	18.4b	0.4b
PLICTRAN 50% WP	30 g	-	-	36.1ab	4.4b	17.8b	8.4b	32.1a	10.0a
UNTREATED CHECK	- -	17.2a	0.88a	51.0a	12.5a	28.4a	12.2a	32.8a	10.4a

LSD = 0.05

[1]Eggs
[2]Motiles
*Treatment means in the same column followed by the same letter are not significantly different at alpha = 0.05 (LSD).

CROP: Apple var. Red & Golden Delicious

PEST: European red mite, Panonychus ulmi (Koch)

TITLE: EVALUATION OF LOW WATER VOLUME VS MEDIUM WATER VOLUME SPRAYING USING PLICTRAN 50W (cyhexatin).

MATERIALS: PLICTRAN 50% WP (cyhexatin).

METHODS: Treatments were applied to rows of 30 tree plots, with either a Kinkelder orchard sprayer for the low water volume or a Niagara orchard sprayer for the medium water volumes. The Kinkelder orchard sprayer delivered 220 L/ha at a pressure of 2,700 kPa and the Niagara orchard sprayer delivered 900 L/ha at a pressure of 2,700 kPa. Plots were replicated 3 times in a complete randomized design. Treatments were applied on July 02, when the adult mite population ranged from 9-16 mites/leaf. At one week and two weeks after treatment, 2 random samples of 25 leaves/row were collected.

NAME AND AGENCY: ENTZ, P.J. and THOMSON, D.A.
Dow Chemical Canada Inc., P.O. Box 1012
Modeland Road, Sarnia, Ontario N7T 7K7

RESULTS: The results are summarized in the table below.

CONCLUSIONS: One week after treatment the 900 L/ha treatment of cyhexatin resulted in the greater control of European red mite when compared to the 220 L/ha treatment. At 2 weeks after treatment there is no difference between treatments.

TREATMENT	RATE (g/ha)	MITE COUNTS/LEAF[1] July 09	July 16
PLICTRAN (low volume)	750	13.95a*	53.08a
PLICTRAN (medium volume)	750	4.84b	21.79a

[1]Average mites/leaf from 2, 25-leaf samples/row.
*Treatment means in the same column followed by the same letter are not significantly different at alpha = 0.05 (LSD).

CROP: Apple var. Red Delicious

PEST: European red mite (ERM), Panonychus ulmi Koch, apple rust mite (ARM), Aculus schlechtendali (Nalepa), lemon-yellow mite (LY), Zetzellia mali (Ewing).

TITLE: EVALUATION OF APOLLO APPLIED AT FIRST COVER FOR CONTROL OF EUROPEAN RED MITE 1987.

MATERIALS: APOLLO 50 SC (clofentezine 300 mL/ha), OMITE 30 WP (propargite 2.5 kg/ha)

METHODS: Treated 3.3 ha with APOLLO by mist-blower 25 June. OMITE was applied 21 July to all trees in the block. Samples of 4 clusters per tree (3 check and 3 treated trees) were taken 26 June, 10 July, 28 July, 10 August and 11 September. Leaves were brushed and counted and mite densities were estimated on a per leaf basis.

NAME AND AGENCY:
HARIMAN, John Michael
Agriculture Canada,
Research Station,
Kentville, N. S.
B4N 1J5

RESULTS: The results are summarized in the table below

CONCLUSIONS: Densities of ERM in the APOLLO plots were slightly above the economic threshold of 10 motiles+ eggs per leaf in late June and early July, so the grower applied OMITE 21 July. After that date counts of both ERM and ARM were low. Predatory mites were not detected in the APOLLO/OMITE plot. Only one LY was found in the OMITE plot.

Date	Treatment[1]	Rate mL/ ha	Number of mites per leaf	
			ERM	ARM
26 June	APOLLO	300	14.7a	35.1a
	Check		28.2a	8.2a
10 July	APOLLO	300	14.6b	36.8a
	Check		55.6a	31.0a
28 July	APOLLO	300	2.8b	1.0a
	Check		33.2a	1.6a
10 August	APOLLO	300	0.1b	1.2a
	Check		5.1a	2.0a
11 Sept.	APOLLO	300	0.6b	27.1a
	Check		7.1a	10.2a

Means within columns on the same date followed by the same letter are not significantly different ($P>0.05$) as determined by Tukey's Studentized range test after square root transformation of the data.

[1]Both Treatments included a 21 July application of OMITE (2.5 kg/ha).

CROP: Apple var. Red Delicious

PEST: European red mite (ERM), *Panonychus ulmi* Koch, apple rust mite (ARM), *Aculus schlechtendali* (Nalepa), lemon-yellow mite (LY), *Zetzellia mali* (Ewing), *Typhlodromus* sp. mites (TP).

TITLE: EFFECT OF APOLLO APPLIED AT PETAL FALL ON APPLE RUST MITE AND PREDACIOUS MITES

MATERIALS: APOLLO 50 SC (clofentezine 300 mL/ha and 450 mL/ha).

METHODS: Treated 1 ha plots by mistblower 5 June. Samples of 4 clusters per tree (2 check and 2 treated trees) were taken 26 June, 10 July, 22 July, 7 August and 31 August. Leaves were brushed and counted and mite densities were estimated on a per leaf basis.

NAME AND AGENCY:
HARDMAN, John Michael
Agriculture Canada,
Research Station,
Kentville, N. S.
B4N 1J5

RESULTS: The results are summarized in the table below

CONCLUSIONS: APOLLO had no obvious adverse effects on ARM or predators. Counts of ERM were low through the season. LY's were relatively abundant in all plots and it is likely that these predators contributed to the low numbers of ERM seen both in the APOLLO plots and in the check. A low count of TP was found in one of the APOLLO plots (300 mL/ha) 31 August.

Date	Treatment	Rate mL/ ha	Number of mites per leaf		
			ERM	ARM	LY
26 June	APOLLO	450	0.0a	0.0a	0.2a
	APOLLO	300	0.0a	0.2a	0.0a
	Check		0.0a	4.3a	0.0a
10 July	APOLLO	450	0.0a	3.5a	0.5a
	APOLLO	300	0.0a	0.7a	0.0b
	Check		0.5a	8.4a	0.0b
22 July	APOLLO	450	0.0a	21.4a	0.5a
	APOLLO	300	0.0a	9.6a	0.5a
	Check		0.0a	37.6a	2.1a
7 August	APOLLO	450	0.0b	48.7a	0.3a
	APOLLO	300	0.0b	122.2a	0.0a
	Check		1.5a	173.0a	1.7a
31 August	APOLLO	450	0.5a	48.4a	0.6a
	APOLLO	300	0.2a	42.8a	0.7a
	Check		0.8a	103.9a	2.4a

Means within columns on the same date followed by the same letter are not significantly different (P>0.05) as determined by Tukey's Studentized range test after square root transformation of the data.

CROP: Apple var. Red Delicious

PEST: European red mite (ERM), Panonychus ulmi Koch, apple rust mite (ARM), Aculus schlechtendali (Nalepa), lemon-yellow mite (LY), Zetzellia mali (Ewing) and Typhlodromus species (TP).

TITLE: EVALUATION OF APOLLO APPLIED AT CALYX FOR CONTROL OF EUROPEAN RED MITE 1987

MATERIALS: APOLLO 50 SC (clofentezine 300 mL/ha)

METHODS: Treated 3.3 ha by mistblower 17 June. Samples of 4 clusters per tree (4 check and 4 treated trees) were taken 25 June, 13 July, 27 July, 10 August and 10 September. Leaves were brushed and counted and mite densities were estimated on a per leaf basis.

NAME AND AGENCY:
HARDMAN, John Michael
Agriculture Canada,
Research Station,
Kentville, N. S.
B4N 1J5

RESULTS: The results are summarized in the tables below.

CONCLUSIONS: APOLLO kept densities of ERM below the economic threshold of 10 motiles+ eggs per leaf through the most of the season. The presence of typhlodromid predators indicated a degree of tolerance to APOLLO. These predators undoubtedly contributed to the low numbers of ERM found in the APOLLO treatment. Low numbers of LY's were found in the check trees, but on their own, they were unable to keep ERM below the economic threshold.

Date	Treatment	Rate mL/ ha	Number of mites per leaf ERM	ARM	TP	LY
25 June	APOLLO	300	22.0a	0.2a	0.1a	0.0a
	Check		10.7a	0.1a	0.0a	0.1a
13 July	APOLLO	300	3.4a	0.4a	0.0a	0.0a
	Check		12.2a	0.3a	0.0a	0.1a
27 July	APOLLO	300	3.6a	0.7a	0.0a	0.0a
	Check		21.5a	0.0b	0.0a	0.2a
10 August	APOLLO	300	4.9b	7.0a	0.0a	0.0a
	Check		50.7a	13.1a	0.0a	0.1a
10 Sept.	APOLLO	300	28.5b	13.0a	0.5a	0.0a
	Check		103.0a	27.3a	0.0a	0.0a

Means within columns on the same date followed by the same letter are not significantly different (P>0.05) as determined by Tukey's Studentized range test after square root transformation of the data.

CROP: Apple var. Red Delicious

PEST: European red mite (ERM), Panonychus ulmi Koch, apple rust mite (ARM), Aculus schlechtendali (Nalepa), lemon-yellow mite (LY), Zetzellia mali (Ewing) and Typhlodromus species (TP).

TITLE: EVALUATION OF MITICIDES APPLIED AT PETAL FALL FOR CONTROL OF EUROPEAN RED MITE 1987

MATERIALS: CARZOL 92 WP (formetanate), MORESTAN 25 WP (quinomethionat), KELTHANE 35 WP (dicofol), APOLLO 50 SC (clofentezine).

METHODS: Four mature trees per treatment sprayed by handgun to runoff at 2800 kPa, 3 June. Samples of 4 clusters per tree (2 trees per treatment) were taken 16 June, 8 July, 20 July, 10 August and 1 September. Leaves were brushed and counted and mite densities were estimated on a per leaf basis.

NAME AND AGENCY:
HARDMAN, John Michael
Agriculture Canada,
Research Station,
Kentville, N. S.
B4N 1J5

RESULTS: The results of ERM and ARM are summarized in the tables below. Low numbers of predatory mites were found with the following treatments: LY's with CARZOL and MORESTAN; TP's with CARZOL and APOLLO.

CONCLUSIONS: MORESTAN, KELTHANE and APOLLO kept densities of ERM below the economic threshold of 10 motiles+ eggs per leaf through the season. CARZOL held densities below threshold until late July. CARZOL, MORESTAN and APOLLO permitted the survival of some predatory mites. All of the products kept densities of ARM lower than in the check plots until early to mid July.

		No. of ERM motiles and eggs per leaf				
Treatments	Rate /100 L	16/06	8/07	20/07	10/08	1/09
CARZOL	11.5 g	2.2b	5.2b	8.4b	19.3a	17.2a
MORESTAN	66.0 g	1.1b	3.1b	4.3b	7.9ab	9.2b
KELTHANE	100.0 g	0.3b	0.0b	1.6c	2.1b	6.0b
APOLLO	13.5 mL	1.9b	2.2b	3.1bc	2.2b	0.7c
Check		28.0a	71.6a	49.6a	11.5ab	0.5c

		No. of ARM per leaf				
Treatments	Rate /100 L	16.06	8/07	20/7	10/8	1/09
CARZOL	11.5 g	1.2b	6.6b	118.5a	145.0ab	11.3a
MORESTAN	66.0 g	2.2b	11.2b	259.8a	30.4b	0.9bc
KELTHANE	100.0 g	0.0b	5.9b	30.2a	182.0ab	14.4a
APOLLO	13.5 mL	0.8b	19.6b	127.8a	216.9a	1.9b
Check		23.5a	115.4a	159.3a	31.2b	0.0c

Means within columns followed by the same letter are not significantly different (P>0.05) as determined by Duncan's multiple range test after square root transformation of the data.

CROP: Apple var. Red Delicious

PEST: European red mite (ERM), Panonychus ulmi Koch, apple rust mite (ARM), Aculus schlectendali (Nalepa), lemon-yellow mite (LY), Zetzellia mali (Ewing) and Typhlodromus species (TP).

TITLE: EVALUATION OF MITICIDES APPLIED AT PINK FOR CONTROL OF EUROPEAN RED MITE 1987

MATERIALS: SAVEY 50 DF (hexythiazox), APOLLO 50 SC (clofentezine), BRIGADE 10 WP (bifentin), MORESTAN 25 WP (chinomethionat), PLICTRAN 50 WP (cyhexatin).

METHODS: Four mature trees per treatment sprayed by handgun to runoff at 2800 kPa, 25 May. Samples of 4 clusters per tree (2 trees per treatment) were taken 16 June, 8 July, 20 July, 10 August and 1 September. Leaves were brushed and counted and mite densities were estimated on a per leaf basis.

NAME AND AGENCY:
HARDMAN, John Michael
Agriculture Canada, Research Station Kentville, Nova Scotia B4N 1J5

RESULTS: The results for ERM and ARM are summarized in the tables below. Low numbers of predatory mites were found with the following treatments: LY's with SAVEY (all treatments) and APOLLO; TP's with SAVEY (all treatments) and MORESTAN.

CONCLUSIONS: SAVEY, APOLLO and MORESTAN gave seasonal control of ERM and allowed the survival of some predacious mites. BRIGADE AND PLICTRAN gave good economic control of ERM to early July. SAVEY and BRIGADE had little impact on ARM, while the other compounds kept ARM numbers below check counts until early July.

Treatments	Rate /100 L	No. of ERM motiles and eggs per leaf 16/06	8/07	20/07	10/08	1/09
SAVEY	3 g	5.9b	4.3b	0.3c	0.5c	0.0c
SAVEY	6 g	3.5bc	0.2b	0.6c	0.3c	0.0c
SAVEY	12 g	5.2bc	1.2b	0.3c	0.3c	0.0c
APOLLO	9 mL	3.9bc	0.8b	4.5c	2.5c	2.0bc
BRIGADE	15 g	5.4b	4.2b	20.6b	41.9a	29.2a
MORESTAN	119 g	0.0c	0.5b	1.7c	1.5c	9.2b
PLICTRAN	30 g	0.0c	0.6b	21.0b	16.5b	27.7a
Check		28.0a	71.6a	49.6a	11.5b	0.5bc

Treatments	Rate /100 L	No. of ARM per leaf 16/06	8/07	20/07	10/08	1/09
SAVEY	3 g	17.5a	17.3bc	315.5a	50.3bc	0.5c
SAVEY	6 g	21.8a	68.1ab	343.7a	73.7bc	0.0c
SAVEY	12 g	14.0ab	65.6ab	221.9ab	42.1bc	0.0c
APOLLO	9 mL	2.2bc	6.5bc	108.9b	117.7b	1.0c
BRIGADE	15 g	13.7ab	56.3abc	206.3ab	113.2b	5.0b
MORESTAN	119 g	0.5c	18.7bc	103.5b	302.6a	9.9ab
PLICTRAN	30 g	0.3c	4.9c	14.0c	248.4a	15.3a
Check		23.5a	115.4a	159.3ab	31.2c	0.0c

Means within columns followed by the same letter are not significantly different (P>0.05) as determined by Duncan's multiple range test after square root transformation of the data.

CROP: Apple var. Red Delicious

PEST: European red mite (ERM), Panonychus ulmi Koch, apple rust mite (ARM), Aculus schlechtendali (Nalepa), lemon-yellow mite (LY), Zetzellia mali (Ewing).

TITLE: EVALUATION OF JULY APPLICATIONS OF APOLLO AND SAVEY FOR CONTROL OF EUROPEAN RED MITE 1987.

MATERIALS: APOLLO 50 SC (clofentezine 9 mL/100 L) and SAVEY 50 DF (hexythiazox 6 g/100 L).

METHODS: Sprayed 2 trees per treatment by handgun to runoff at 2800 kPa, 9 July. Samples of 4 clusters per tree (2 trees per treatment) were taken 9 July (precount), 16 July, 20 July, 10 August and 1 September. Leaves were brushed and counted and mite densities were estimated on a per leaf basis.

NAME AND AGENCY:
HARDMAN, John Michael
Agriculture Canada,
Research Station,
Kentville, N. S.
B4N 1J5

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Both APOLLO and SAVEY required several weeks to reduce densities of ERM from initial counts of more than 70 per leaf to the economic threshold of 10 motiles+ eggs per leaf. Generally counts of ARM were similar in the treated plots and the check plots, although the 16 July count in the APOLLO plot was lower than in the SAVEY and check plots. LY predatory mites were found once in the SAVEY plot and once in the check plot.

Date	Treatment	Rate /100 L	Number of mites per leaf	
			ERM	ARM
9 July	APOLLO	9 mL	71.6a	115.4a
	SAVEY	6 g	77.9a	133.2a
16 July	APOLLO	9 mL	27.4a	43.6b
	SAVEY	6 g	62.9a	430.7a
	Check		73.7a	449.4a
20 July	APOLLO	9 mL	15.5b	55.5a
	SAVEY	6 g	30.0b	125.4a
	Check		83.0a	137.8a
10 August	APOLLO	9 mL	0.3b	10.0a
	SAVEY	6 g	2.3b	23.0a
	Check		11.5a	31.2a
1 September	APOLLO	9 mL	0.0a	0.0a
	SAVEY	6 g	0.5a	2.0a
	Check		0.5a	0.0a

Means within columns on the same date followed by the same letter are not significantly different (P>0.05) as determined by Tukey's Studentized range test after square root transformation of the data.

CROP: Apple var. Red Delicious

PEST: European red mite (ERM), Panonychus ulmi Koch, apple rust mite (ARM), Aculus schlechtendali (Nalepa), lemon-yellow mite (LY), Zetzellia mali (Ewing).

TITLE: EVALUATION OF APOLLO APPLIED AT PINK FOR CONTROL OF EUROPEAN RED MITE 1987

MATERIALS: APOLLO 50 SC (clofentezine 450 mL/ha)

METHODS: Treated 1 ha by mistblower 19 May. Samples of 4 clusters per tree (3 check and 4 treated trees) were taken 26 June, 10 July, 28 July, 10 August and 10 September. Leaves were brushed and counted and mite densities were estimated on a per leaf basis.

NAME AND AGENCY:
HARDMAN, John Michael
Agriculture Canada,
Research Station,
Kentville, N. S.
B4N 1J5

RESULTS: The results are summarized in the table below

CONCLUSIONS: APOLLO kept densities of ERM below the economic threshold of 10 motiles+ eggs per leaf through the season. The presence of LY's indicated they had some tolerance to APOLLO. These predators probably contributed to the low numbers of ERM found in the APOLLO treatment and suppressed increases in the check trees.

Date	Treatment	Rate mL/ ha	Number of mites per leaf		
			ERM	ARM	LY
26 June	APOLLO	450	0.4b	6.8a	0.0a
	Check		16.2a	20.0a	1.3a
10 July	APOLLO	450	2.0b	7.9b	0.1a
	Check		25.8a	81.0a	0.3a
28 July	APOLLO	450	0.5b	99.9a	0.3a
	Check		22.8a	84.4a	0.3a
10 August	APOLLO	450	0.3b	158.7a	0.1a
	Check		21.3a	94.5a	0.7a
10 Sept.	APOLLO	450	0.6b	8.6a	0.1b
	Check		20.6a	8.9a	1.4a

Means within columns on the same date followed by the same letter are not significantly different (P>0.05) as determined by Tukey's Studentized range test after square root transformation of the data.

CROP: Apple var. McIntosh

PEST: European red mite (ERM), Panonychus ulmi Koch, apple rust mite (ARM), Aculus schlechtendali (Nalepa), lemon-yellow mite (LY), Zetzellia mali (Ewing) and Typhlodromus species (TP).

TITLE: EFFECT OF FUNGICIDES USED FOR APPLE SCAB ON PHYTOPHAGOUS AND PREDACIOUS MITES, 1987

MATERIALS: ACR 3815 70 WP (3.3% pyrifenox + 66.7% mancozeb), MANZATE 200 75 DF (mancozeb), NUSTAR 20 DF (DPX H 6573), POLYRAM 80 WP (metiram), PP 523 F (hexaconazole), RH 3866 60 DF (myclobutanil), TOPAS/MZ 61 WP (penconazole).

METHODS: Treatments were applied to single tree plots with a hand-held gun at a pressure of 2100 kPa to runoff (approximately 3000 L/ha). Fungicides were applied in a 25 yr old apple orchard (varieties McIntosh and Cortland) using a row and column block design with 4 single trees for each spray regime. Row blocks were formed by adjacent rows of each variety. Treatments were applied on 27 April, 6 and 19-20 May, 1, 12-13 and 23 June, and 6, 17 and 30 July. Samples of 4 clusters per tree (2 McIntosh trees per treatment) were taken 23 July and 27 August, 1987. Leaves were brushed and counted and mite densities were estimated on a per leaf basis. Location: Kentville, Nova Scotia.

NAME AND AGENCY:
HARDMAN, John Michael
LOCKHART, C. L.
Agriculture Canada, Research Station
Kentville, N. S. B4N 1J5

RESULTS: The results are summarized in the tables.

CONCLUSIONS: In all plots except TOPAS/MZ, densities of ERM were below the economic threshold of 10 motiles + eggs per leaf. Counts of ARM were below economic levels in all plots. Typhlodromid predators were found in the BAYCOR, NUSTAR/MANZATE 200, ACR 3815, PP523 + DITHANE M-45 and DITHANE M-45 plots suggesting tolerance to these treatments. LY predators were found in the BAYCOR, RH 3866 + DITHANE M-45 and ACR 3815 plots.

		Number of mites per leaf							
	Rate	3 July 1987				27 August 1987			
Treatment	kg ai/ha	ERM	ARM	TP	LY	ERM	ARM	TP	LY
BAYCOR	0.250	1.5a	64.9a	2.9a	0.0a	0.0b	1.2a	0.7a	0.5a
BAYCOR+	0.125	4.2a	126.8a	0.0b	0.0a	4.1ab	0.8a	0.0a	0.0a
POLYRAM	2.640								
NUSTAR to calyx	0.020	0.0a	24.7a	0.0b	0.0a	1.6ab	23.7a	0.9c	0.0a
then MANZATE 200	4.000								
in cover sprays									
NUSTAR to calyx	0.040	1.4a	28.5a	0.0b	0.0a	6.2ab	36.5a	0.3a	0.0a
then MANZATE 200	4.000								
in cover sprays									
NUSTAR to calyx	0.060	0.8a	22.8a	0.0b	0.0a	1.5ab	13.5a	0.5a	0.0a
then MANZATE 200	4.000								
in cover sprays									
MANZATE 200 to	5.400	3.3a	125.9a	0.0b	0.0a	3.1ab	12.0a	0.0a	0.0a
calyx in cover sprays									
TOPAS/MZ	2.745	1.6a	144.3a	0.0b	0.0a	21.4a	5.2a	0.0a	0.0a
RH 3866 +	0.135	3.3a	108.9a	0.0b	0.0a	5.2ab	9.7a	0.0a	0.0a
DITHANE M-45	2.720								
RH 3866+	0.105	1.0a	170.5a	0.0b	0.0a	1.1ab	4.0a	0.0a	0.0a
DITHANE M-45	2.720								
RH 3866+	0.075	1.0a	200.1a	0.0b	0.0a	7.8ab	8.1a	0.0a	0.7a
DITHANE M-45	2.720								
ACR 3815	2.800	1.9a	159.4a	0.0b	0.0a	5.8ab	10.9a	0.0a	0.0a
ACR 3815	3.150	2.2a	113.0a	0.0b	0.3a	8.2a	39.3a	0.9a	0.0a
PP523 to calyx	0.040	5.4a	78.8a	0.0b	0.0a	6.1ab	8.3a	0.9a	0.0a
then PP523	0.020								
+ DITHANE M-45	2.500								
in cover sprays									
DITHANE M-45	5.400	0.8a	137.2a	0.0b	0.0a	2.1ab	16.9a	0.3a	0.0a
Check		0.2c	91.9a	0.5b	0.2a	0.4ab	0.0a	0.0a	0.7a

Means within columns on the same date followed by the same letter are not significantly different ($P>0.05$) as determined by Tukey's Studentized range test after square root transformation of the data.

CROP: Apple cv. Red Delicious

PEST: European Red Mite, *Panonychus ulmi* (Koch)

TITLE: EVALUATION OF MITICIDES FOR EARLY SEASON CONTROL OF EUROPEAN RED MITE.

MATERIALS: APOLLO 420 g ai/L S.C. (Clofentezine), SAVEY 50 W (hexythiazox), PLICTRAN 50 W (cyhexatin), CARZOL 92 S.P. (formetanate hydrochloride).

METHODS: Treatments were replicated four times and arranged according to a randomized complete block design in a 3-year-old planting of Red Delicious on M26 rootstock with tree spacing 3.1 m by 4.9 m. Treatments were assigned to three-tree plots and applied using a truck-mounted sprayer equipped with a Spraying Systems handgun fitted with a D-6 orifice plate. Pressure was set at 1379 kPa. Materials were diluted to a rate comparable to 3370 L of water per ha. and plots were sprayed until runoff. PLICTRAN, SAVEY, and CARZOL were applied on May 5 (3 L/plot) when buds were at the pink stage (approximately 50% hatch of overwintering eggs), and APOLLO was applied on May 29 (all life stages present) at petal fall (4.5 L/plot). Plots were first sampled May 6. Twenty-five fruit spur leaf clusters were randomly picked from the lower central part of the tree canopy throughout the block and examined under a binocular microscope. Numbers of unhatched European red mite (ERM) eggs and first-instars were noted. Plots were subsequently sampled May 25, June 10, 29, July 27 and Aug. 18. Sixty leaves were picked from each plot. Five of these were examined under a binocular microscope and 45 were brushed with a Henderson-McBurnie mite brushing machine. Numbers of eggs, actives stages and Phytoseiid predators were recorded. On July 7 plots were sampled for spotted tentiform leafminer (STLM). Fifty leaves were picked/plot and examined under a binocular microscope. The numbers of living STLM were recorded. Data were analysed using an analysis of variance and means were compared with a Duncan's multiple range test at the 0.05 level of significance.

NAME AND AGENCY:
MARSHALL, D.B. and PREE, D.J.
Agriculture Canada, Research Station
VINELAND STATION, Ontario LOR 2E0

RESULTS: As presented in the table below.

CONCLUSIONS: Plots treated with SAVEY had the fewest eggs and actives in the May 25 sample. By June 10 the number of actives/leaf was statistically lower in the plots treated with SAVEY, APOLLO and PLICTRAN than the CARZOL or the untreated control plots. Phytoseiid mites were found in APOLLO, PLICTRAN and control plots. In the June 29 sample the fewest eggs and actives were found in the SAVEY and APOLLO treated plots. Significantly higher numbers of eggs and actives were found in the CARZOL treated plots than any of other plots. Numbers of Phytoseiids were lowest in the APOLLO and SAVEY treated plots July 27. There was no significant difference in numbers of eggs, actives or Phytoseiids between treatments in the July 27 and Aug. 18 samples. No statisical differences in STLM numbers were found between treatments.

OBSERVATIONS: In the May 6 sample 208 ERM first-instars were found on 25 fruit spur leaf clusters. Approximately 50% of the eggs had hatched at this time.

Treatment	Rate g a.i./ha	May 25 eggs[1]/ leaf	May 25 actives[2]/ leaf	June 10 eggs/ leaf	June 10 actives/ leaf	June 10 Phytos/ leaf	June 29 eggs/ leaf	June 29 actives/ leaf	June 29 Phytos/ leaf
SAVEY 50 W[4]	100.0	0.17a[3]	0.35a	0.20a	0.14a	0.00a	0.29a	0.45a	0.11ab
APOLLO 420 S.C.[5]	126.0	1.82ab	2.00 c	2.20 c	0.23a	0.66a	0.31a	0.19a	0.06a
PLICTRAN 50 W[4]	625.0	0.68ab	0.79ab	0.18a	0.52a	0.04a	0.90ab	2.19 b	0.04a
CARZOL 92 S.P.[4]	1012.0	1.39ab	1.62 bc	1.57 bc	2.43 b	0.00a	1.81 c	3.22 c	0.04a
Control	-	2.08 b	1.64 bc	0.72ab	1.55 b	0.02a	1.0 b	2.16 b	0.24 b

Treatment	Rate g a.i./ha	July 27 eggs / leaf	July 27 actives/ leaf	July 27 Phytos/leaf	Aug. 18 eggs/leaf	Aug. 18 actives/ leaf	Aug. 18 Phytos/leaf	July 7 STLM
SAVEY 50 W[4]	100.0	1.14a	0.61a	0.68a	1.47a	1.16a	0.70a	14.25a
APOLLO 420 S.C.[5]	126.0	0.70a	0.42a	0.34a	2.89a	1.83a	0.38a	9.00a
PLICTRAN 50 W[4]	625.0	3.09a	1.97a	0.79a	2.40a	1.58a	0.50a	10.50a
CARZOL 92 S.P.[4]	1012.0	4.24a	2.09a	0.76a	2.06a	1.10a	0.81a	10.50a
Control	-	3.86a	2.23a	1.20a	1.25a	0.92a	0.51a	7.00a

1 eggs include both viable and dead eggs
2 actives includes nymphs and adults
3 means followed by the same letter not significantly different ($P < 0.05$, Duncan's multiple range test)
4 applied May 5
5 applied May 29

CROP: Apple cv. McIntosh

PEST: European Red Mite, *Panonychus ulmi* (Koch)

TITLE: EVALUATION OF PESTICIDES FOR EARLY SEASON MITE CONTROL.

MATERIALS: Superior oil 70 vis., oil concentrate, BASF 166 801 100 g a.i./L S.C., MORESTAN 25 WP (chinomethionat), ABG 6198-A 3% S.C. (*Bacillus thuringiensis*).

METHODS: Treatments were replicated four times and assigned to three-tree plots according to a randomized complete block design in a 3-year-old block of McIntosh on M26 rootstock. Tree spacing was 3.1 m by 4.9 m. Treated and untreated control plots were separated by guard trees. Materials were diluted to a concentration comparable to 3370 L of water/ha and applied until runoff with a truck-mounted sprayer equipped with a Spraying Systems handgun fitted with a D-6 orifice plate. Pressure was set at 1379 kPa. Superior oil 70 vis. and oil concentrate were applied May 1 (2 L/plot) when buds were at the ½-inch-green stage. BASF 166 801, MORESTAN, and ABG 6198-A were applied on May 6 (3 L/plot). Flower tree buds were at the pink stage. Plots treated May 6 with ABG 6198-A were treated with a second application of ABG 6198-A at petal fall on May 25. Plots were first sampled on May 21 when 60 leaves were picked from each plot. Five of these leaves were examined under a binocular microscope. Forty-five of the remaining were brushed with a Henderson-McBurnie mite brushing machine. Plots were subsequently sampled June 11 and July 8. Data were analysed using an analysis of variance and means were compared with a Duncan's multiple range test at the 0.05 significance level.

NAME AND AGENCY:
MARSHALL, D.B. and PREE, D.J.
Agriculture Canada, Research Station
VINELAND STATION, Ontario L0R 2E0

RESULTS: As presented in the table below.

CONCLUSIONS: European red mite numbers were low from the start and remained low throughout the season in this block. Numbers of eggs were similar in all plots May 21. Plots treated with superior oil 70 vis. had the lowest number of actives. The highest number of actives were found in the BASF 166 801 and ABG 6198-A treated plots (0.51 and 0.47, respectively). On June 11 numbers of eggs were again similar in all plots. The fewest active stages were found in superior oil 70 and ABG 6198-A treated plots, and the highest numbers were in the BASF 166 801 treated plots. Phytoseiids were most numerous in the untreated control plots. By July 8 there were no significant differences in numbers of eggs, actives, or phytoseiids between treatments. Phytoseiid counts continued to be highest in the untreated control plots.

Treatment	Rate/ha	May 21 eggs[1]/ leaf	May 21 actives[2]/ leaf	June 11 eggs/ leaf	June 11 actives/ leaf	June 11 phytos/ leaf	July 8 eggs/ leaf	July 8 actives/ leaf	July 8 phytos/ leaf
Superior oil 70[4]	65 L	0.04a[3]	0.05a	0.11a	0.14 b	0.06ab	1.15a	0.39a	0.05a
Oil concentrate[4]	16.85 L	0.00a	0.18ab	0.11a	0.37ab	0.11ab	1.74a	0.45a	0.09a
BASF 166 801[5] 100 g a.i./L	505.5 g a.i.	0.10a	0.51 b	0.30a	0.63a	0.10ab	2.35a	0.53a	0.12a
MORESTAN 25 WP[5]	562.5 g a.i.	0.04a	0.21ab	0.11a	0.26ab	0.10ab	2.87a	0.84a	0.02a
ABG 6198-A[6] 3% S.C.	174 g a.i.	0.00a	0.47ab	0.28a	0.17 b	00.0 b	1.92a	0.90a	0.02a
Control	-	0.05a	0.29ab	0.28a	0.38ab	0.16a	2.67a	0.74a	0.24a

1 eggs include both viable and dead eggs
2 actives include nymphs and adults
3 means followed by the same letter not significantly different ($P < 0.05$, Duncan's multiple range test)
4 applied May 1 (½ inch green)
5 applied May 6 (pink)
6 applied May 6 (pink), May 25 (petal fall)

CROP: Apple

PEST: European red mite, Panonychus ulmi (Koch)

TITLE: COMPARISON OF TWO DORMANT OILS FOR CONTROL OF EUROPEAN RED MITE AND PHYTOTOXICITY.

MATERIALS: OKANAGAN DORMANT OIL (Mohawk Lubricants Ltd.) and SUNSPRAY 11-E (Sunoco Inc.).

METHODS: The apple orchard used in this test was 18 years old, planted on M26 rootstocks 4.9 m between rows and 4.25 m between trees. The orchard was divided into 4 blocks of 54 trees each. Each block contained 3 plots of 18 trees each of Red Delicious, Golden Delicious and Spartan varieties. The treatments were: Control, no spray; SUNSPRAY 11-E at 45 and 90 L/ha and OKANAGAN DORMANT OIL at 90 L/ha. The sprays were applied 6 April with a low-volume air-blast type sprayer calibrated to deliver 3000 L/ha of spray. The apple trees were at the tight cluster-bud stage of growth. Foliage in the different treatments and varieties were observed at weekly intervals through April to mid-May for phytotoxicity and in early September the bark on the 1986 twig growth was observed for comparison of possible effects on bark lenticel development. On 16 June, 10 leaves from 10 trees in each plot were examined and numbers of European red mite egg and active stages counted.

NAME AND AGENCY:
McMULLEN, R.D.
Agriculture Canada
Research Station
Summerland, British Columbia V0H 1Z0

RESULTS: On 16 June, there were significant differences between the number of European red mite eggs and active stages among the varieties in the control plots but not among the varieties in any of the treated plots. Therefore, to simplify the comparisons, the values for the varieties in the control plots and treatment plots were combined.

None of the treatments resulted in phytotoxic symptoms to blossom buds or foliage, nor was there any detectable effect of the oil treatments on bark lenticels.

CONCLUSIONS: SUNSPRAY 11-E, a 110 viscosity oil, provided excellent control of European red mite at the rate of 45 L/ha. The higher rate of 90 L/ha, which would be the rate used for control of scale insects, was equally non-phytotoxic in respect to foliage and bark damage as the 90 L/ha rate of OKANAGAN DORMANT OIL, a 200 viscosity oil of the type currently recommended for use on fruit trees in British Columbia.

Treatment	Rate L/ha	Mean No. ERM per 100 Leaves[1]	
		Eggs	Active
Control	no treatment	82.3 a	22.3 a
SUNSPRAY 11-E	45	0.7 b	0.2 b
SUNSPRAY 11-E	90	1.1 b	0.2 b
OKANAGAN DORMANT OIL	90	1.3 b	0.3 b

[1]Means followed by the same letter within columns are not significantly different (LSD, $P < 0.01$).

CROP: Apple var. McIntosh

PEST: European Red Mite, Panonychus ulmi (Koch) Two-spotted spider mite, Tetranychus urticae (Koch).

TITLE: Orchard evaluation of DPX-Y5893 for the control of European Red Mite and Two-spotted Spider Mite - 1

MATERIALS: DPX-Y5893 50% DF (SAVEY™, hexythiazox)
CARZOL 92% WP (formetanate hydrochloride)

METHODS: Treatments 1 to 3 were applied at economic threshold on 01/07/87. CARZOL was applied at pink on 08/05/87 and at economic threshold on 01/07/87. Treatments consisted of single tree plot replicated three times in a randomized complete block design. Applications were made with a hand gun at a volume of 784 L/ha at the pink and economic threshold stages with a pressure of 2250 kPa. Twenty-five leaves per tree were sampled at random and total counts performed after brushing mites and eggs on a glass plate. Untreated trees were sprayed with CARZOL at the end of July to avoid further damage to trees.
Location: Rougemont, Quebec.

NAME AND AGENCY
Poliquin, Bernard
Turcotte, Diane
Du Pont Canada Inc., Agricultural Products
P.O. Box 660, Station "A"
Montreal (Quebec) H3C 2V1

RESULTS: The results are summarized in the table below.

CONCLUSIONS: On July 21, SAVEY at 50 g ai/ha was sufficient to provide adequate suppression of the E.R.M. and T.S.S.M. motile forms and was not significantly different from higher rates of SAVEY or the standard treatment. As the season progressed, the same results were noticed for the E.R.M. motile forms but 100 g ai/ha of SAVEY was necessary to obtain T.S.S.M. suppression not significantly different from the standard treatment. On August 25, 100 g ai/ha of SAVEY was the best treatment for the suppression of both E.R.M. and T.S.S.M. motile forms and was significantly better than CARZOL sprayed twice in the season. E_{gg} counts do not follow a rate response pattern on our last two evaluation dates due to the healthy appearance of eggs laid by sterile females in the SAVEY treated plots. Overall, an application of SAVEY at 50 g ai/ha maintained all forms of E.R.M. and T.S.S.M. below economic threshold for up to 55 days after application.

EVALUATION DATE	TREATMENT	RATE g ai/ha	FIRST DATE APPLIED	SECOND DATE APPLIED	NUMBER OF MITES AND EGGS PER LEAF: EUROPEAN RED MITE(ERM) MOTILE FORMS	EUROPEAN RED MITE(ERM) EGGS	TWO-SPOTTED SPIDER MITE(TSSM) MOTILE FORMS	TWO-SPOTTED SPIDER MITE(TSSM) EGGS
July 21, 1987	DPX-Y5893	50	01/07/87		0.3 a*	0.5 a	0.5 a	0.9 bc
	DPX-Y5893	100	01/07/87		0.3 a	0.8 a	0.4 a	1.5 c
	DPX-Y5893	150	01/07/87		0.3 a	0.8 a	0.2 a	0.4 ab
	CARZOL	1380	08/05/87	01/07/87	0.0 a	0.0 a	0.1 a	0.0 a
	Check	-			2.9 b	5.1 b	4.9 b	5.7 d
	LSD				(0.772)	(1.335)	(0.679)	(0.891)
August 4, 1987	DPX-Y5893	50	01/07/87		0.7 a	1.5 c	1.1 b	5.2 d
	DPX-Y5893	100	01/07/87		0.3 a	0.8 b	0.4 a	1.7 b
	DPX-Y5893	150	01/07/87		0.2 a	0.7 b	0.3 a	1.8 b
	CARZOL	1380	08/05/87	01/07/87	0.1 a	0.1 a	0.2 a	0.4 a
	Check	-			1.7 b	0.8 b	2.5 c	2.8 c
	LSD				(0.762)	(0.562)	(0.334)	(0.938)
August 24, 1987	DPX-Y5893	50	01/07/87		1.2 bc	1.4 a	2.7 b	4.2 c
	DPX-Y5893	100	01/07/87		0.5 ab	1.3 a	0.9 a	3.0 b
	DPX-Y5893	150	01/07/87		0.3 a	0.8 a	0.4 a	2.0 a
	CARZOL	1380	08/05/87	01/07/87	1.8 c	1.0 a	3.5 b	5.4 d
	Check	-			3.5 d	2.2 b	7.6 c	11.3 e
	LSD				(0.755)	(0.694)	(1.250)	(0.973)

* Treatment means in the same column followed by the same letter are not significantly different at the 5% level (LSD.05)

CROP: Apple var. Empire

PEST: European Red Mite, Panonychus ulmi (Koch) Two spotted spider mite, Tetranychus urticae (Koch).

TITLE: Orchard evaluation of DPX-Y5893 for the control of European Red Mite and Two Spotted Spider Mite - 2

MATERIALS: DPX-Y5893 DF (SAVEY™, hexythiazox), CARZOL 92% WP (formetanate hydrochloride).

METHODS: Treatments 1 to 3 were applied at economic threshold on 01/07/87. CARZOL was applied at pink on 08/05/87 and at economic threshold on 01/07/87. Treatments consisted of single tree plots replicated three times in a randomized complete block design. Applications were made with a hand gun at a volume of 784 L/ha at the pink and economic threshold stages with a pressure of 2250 kPa. Twenty-five leaves per tree were sampled at random and total counts performed after brushing mites and eggs on a glass plate. Untreated trees were sprayed with CARZOL at the end of July to avoid further damage to trees.
Location: St-Gregoire, Quebec.

NAME AND AGENCY:
Poliquin, Bernard
Turcotte, Diane
Du Pont Canada Inc., Agricultural Products
P.O. Box 660, Station "A"
Montreal (Quebec) H3C 2V1

RESULTS: The results are summarized in the table below.

CONCLUSIONS: On July 20, SAVEY at 50 g ai/ha was sufficient to provide adequate suppression of the E.R.M. and T.S.S.M. motile forms and was not significantly different from higher rates of SAVEY or the standard treatment. The same results were seen at our second evaluation, 35 days after application and on August 24 in the case of the E.R.M. At that time however, it seemed like 100 g ai/ha was necessary to provide adequate control of the T.S.S.M. motile forms. In all cases the untreated check was significantly different than all other treatments, although these trees had been sprayed with CARZOL to prevent further damage to the trees at the end of July. Egg counts for all three evaluations do not follow a rate response pattern due to the healthy appearance of eggs laid by sterile females in the SAVEY treated plots. Overall, an application of SAVEY at 50 g ai per hectare maintained the active forms of E.R.M. and T.S.S.M. below economic threshold for up to 54 days after treatment.

EVALUATION DATE	TREATMENT	RATE g ai/ha	FIRST DATE APPLIED	SECOND DATE APPLIED	NUMBER OF MITES AND EGGS PER LEAF: EUROPEAN RED MITE (ERM) MOTILE FORMS	EUROPEAN RED MITE (ERM) EGGS	TWO-SPOTTED SPIDER MITE(TSSM) MOTILE FORMS	TWO-SPOTTED SPIDER MITE(TSSM) EGGS
July 20 1987	DPX-Y5893	50	01/07/87		0.4 a*	3.6 b	2.8 a	9.0 bc
	DPX-Y5893	100	01/07/87		0.7 a	2.8 ab	2.1 a	6.2 b
	DPX-Y5893	150	01/07/87		0.5 a	4.1 b	1.8 a	3.0 a
	CARZOL	1380	08/05/87	01/07/87	0.1 a	0.6 a	0.2 a	0.3 a
	Check	-			10.9 b	46.0 c	8.1 b	9.2 c
	LSD				(1.364)	(2.218)	(5.116)	(2.834)
August 3 1987	DPX-Y5893	50	01/07/87		0.5 a	1.7 b	0.5 a	1.9 d
	DPX-Y5893	100	01/07/87		0.1 a	0.7 a	0.4 a	1.2 cd
	DPX-Y5893	150	01/07/87		0.2 a	1.4 b	0.4 a	1.0 bc
	CARZOL	-			3.2 b	1.3 b	1.8 b	1.1 c
	LSD				(0.767)	(0.616)	(0.736)	(0.702)
August 24, 1987	DPX-Y5893	50	01/07/87		1.2 a	2.9 b	3.3 b	11.5 c
	DPX-Y5893	100	01/07/87		0.3 a	1.4 a	1.4 a	5.4 b
	DPX-Y5893	150	01/07/87		0.3 a	2.0 ab	1.0 a	4.5 ab
	CARZOL	1380	08/05/87	01/07/87	0.6 a	1.8 ab	1.1 a	3.6 a
	Check	-			6.8 b	7.4 c	5.8 c	10.1 c
	LSD				(1.435)	(1.209)	(1.651)	

* Treatment means in the same column followed by the same letter are not significantly different at the 5% level (LSD.05)
Data has been log transformed for analysis.

CROP: Apple Var. Cortland

PEST: European red mite, Panonychus ulmi (Koch)

TITLE: EVALUATION OF SAVEY™ FOR CONTROL OF EUROPEAN RED MITE IN APPLES, 1987.

MATERIALS: SAVEY 50 DF (DPX-Y5893, hexythiazox), PLICTRAN 50 WP (cyhexatin).

METHODS: Treatments were applied to single-tree plots with a hand gun at a pressure of 1380 kPa (4000 litres per hectare). Plots were replicated 4 times in a randomized complete block design. Treatments were applied on June 18 (3rd cover), at a planned timing of 4-5 individuals per leaf (all forms). Fungicides and insecticides were applied as required to control scab and insect pests. Samples of 25 leaves per tree were taken at 14-day intervals. Mites were removed with a brushing machine and motile forms and eggs were counted under a binocular microscope. Location: Delaware, Ontario.

NAME AND AGENCY:
REDMOND, S.G., HEPBURN, J.E.
Du Pont Canada Agricultural Products
7-475 Sandringham Cres., London, Ontario N6C 5B9

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Throughout the experiment no significant difference was noted for ERM egg populations versus the check. On the first evaluation date (July 3) all treatments had significantly fewer motile forms compared to the check. Six weeks after application (July 30) all rates of SAVEY had significantly fewer motile forms than the PLICTRAN treatment and the check. Eight weeks after application (August 12) the population of motile forms of Panonychus ulmi were significantly fewer in all SAVEY treatments versus PLICTRAN and the check.

TREATMENT	RATE g ai/ha	COUNTS PER LEAF JULY 3 MOTILE	JULY 3 EGGS	JULY 30 MOTILE	JULY 30 EGGS	AUGUST 12 MOTILE	AUGUST 12 EGGS
SAVEY	50	3.9 a*	15.0 a	1.5 a	4.3 a	0.9 a	2.9 a
SAVEY	100	3.5 a	21.2 a	0.4 a	3.4 a	0.3 a	2.2 a
SAVEY	150	3.7 a	22.8 a	0.3 a	4.1 a	0.3 a	2.4 a
PLICTRAN	625	2.8 a	6.4 a	4.6 b	3.4 a	6.2 b	9.7 b
Check	-	13.9 b	20.9 a	6.6 b	5.0 a	5.3 b	4.7 a
LSD		(5.24)	(22.44)	(2.44)	(3.8)	(1.96)	(3.71)

* Values by observation followed by the same letter are not significantly different (LSD 0.05)

CROP: Apple Var. Red Delicious

PEST: European red mite, Panonychus ulmi (Koch)

TITLE: EVALUATION OF SAVEY™ FOR CONTROL OF EUROPEAN RED MITE IN NON-BEARING APPLES, 1987.

MATERIALS: SAVEY 50 DF (DPX-Y5893, hexythiazox), PLICTRAN 50WP (cyhexatin).

METHODS: Treatments were applied to plots containing 15 trees with a handgun at a pressure of 1380 kPa (4000 litres per hectare). Plots were replicated 4 times in a randomized complete block design. Treatments were applied on June 19 (3rd cover), when the number of motile and egg forms of ERM had reached 6 per leaf. Samples of 25 leaves per plot were taken at 14-day intervals. Mites were removed with a brushing machine and motile forms and eggs were counted under a binocular microscope.
Location: Delaware, Ontario.

NAME AND AGENCY:
REDMOND, S.G., HEPBURN, J.E.
Du Pont Canada Agricultural Products
7-475 Sandringham Cres., London, Ontario N6C 5B9

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Eight weeks after application (August 12), Panonychus ulmi egg counts were significantly fewer in the SAVEY treatments versus the PLICTRAN and check treatments. Throughout the experiment all SAVEY treatments had significantly fewer Panonychus ulmi motile forms versus the check. Counts of motile forms at six weeks and eight weeks after application both showed significantly fewer motile forms in the SAVEY treatments compared to the PLICTRAN treatment.

TREATMENT	RATE g ai/ha	COUNTS PER LEAF JULY 3 MOTILE	JULY 3 EGGS	JULY 30 MOTILE	JULY 30 EGGS	AUGUST 12 MOTILE	AUGUST 12 EGGS
SAVEY	50	1.3 a*	7.6 a	1.5 b	1.7 a	0.9 a	2.3 a
SAVEY	100	1.7 a	10.1 a	1.1 b	1.9 a	0.6 a	1.5 a
SAVEY	150	1.1 a	9.4 a	0.3 a	1.3 a	0.1 a	0.7 a
PLICTRAN	625	2.3 ab	8.2 a	3.3 c	2.4 ab	2.4 b	4.4 b
Check	-	5.4 b	16.5 a	3.7 c	3.2 b	2.3 b	5.2 b
LSD		(3.46)	(13.5)	(0.75)	(1.20)	(0.93)	(1.88)

* Values followed by the same letter are not significantly different (LSD 0.05)

CROP: Apple var. Red Delicious

PEST: European red mite, Panonychus ulmi (Koch), two-spotted spider mite, Tetranychus urtica (Koch), apple rust mite, Aculus schlechtendali (Nalepa).

TITLE: EVALUATION OF SAVEY FOR CONTROL OF MITES IN APPLES

MATERIALS: SAVEY (DPX Y 5893, hexythiazox), PLICTRAN 50 WP (cyhexatin).

METHODS: Treatments were applied to single tree plots with a hand gun at a pressure of 700 kPa to runoff (3000 L/Ha). Plots were replicated 3 times in a nonrandom design. Treatments were applied June 22. Fungicides and insecticides were applied as required to control scab and insect pests. Mites were removed from leaf samples with a brushing machine and counted under a binocular microscope. Samples of 25 leaves per tree were taken on June 16, July 14, and August 13.

Location: Woodville, Nova Scotia

NAME AND AGENCY:
ROGERS R.E.L. and JOTCHAM, J.R.
Marbicon Biological Consultants
P.O. Box 900, Berwick, Nova Scotia B0P 1E0

RESULTS: The results are summarized in the table below.

Conclusions: Savey and Plictran applied at hatch of first summer egggs of European red mite (ERM) resulted in July counts of ERM that were significantly lower than the check counts. the counts of ERM for Savey and Plictran were not significantly different from each other. Two-spotted spider mites were not detected until August, and they were significantly more abundant in the check plots. Apple rust mite counts in July for Savey at 150 g ai/ha and Plictran were significantly lower then for other treatments.

			EGGS AND ACTIVE MITES PER LEAF[1,2]		
MITES	TREATMENT	RATE (g ai/ha)	June 16 (pretreatment)	July 14	August 13
European red mite	Check	-	14.93a	119.20b	28.67a
	PLICTRAN 50 WP	1000	4.27a	12.00a	4.04a
	SAVEY	50	8.27a	13.87a	5.33a
	SAVEY	100	14.13a	11.47a	3.20a
	SAVEY	150	11.47a	13.33a	3.33a
Two-spotted spider mite	Check	-	0 a	0 a	11.56b
	PLICTRAN 50 WP	1000	0 a	0 a	0.27a
	SAVEY	50	0 a	0 a	0.27a
	SAVEY	100	0 a	0 a	0 a
	SAVEY	150	0 a	0 a	0.27a
Apple rust mite	Check	-	3.00a	6.00b	2.00a
	PLICTRAN 50 WP	1000	2.00ab	3.33a	2.33a
	SAVEY	50	2.00ab	5.33b	2.33a
	SAVEY	100	1.33b	5.33b	2.67a
	SAVEY	150	1.67b	4.00a	2.00a

1. Means in each column, for each species, followed by the same letter are not significantly different at the 5% level (LSD test).

2. Apple rust mite was assessed qualitatively on a scale of 1 - 6. (eg. 1 = no mites, 5 = 500-600 mites/leaf (economic threshold)).

CROP: Apple var. McIntosh

PEST: European red mite, Panonychus ulmi (Koch), two-spotted spider mite, Tetranychus urtica (Koch), apple rust mite, Aculus schlechtendali (Nalepa).

TITLE: EVALUATION OF SAVEY FOR CONTROL OF MITES IN APPLES

MATERIALS: SAVEY (DPX Y 5893, hexythiazox), PLICTRAN 50 WP (cyhexatin).

METHODS: Treatments were applied to single tree plots with a hand gun at a pressure of 700 kPa to runoff (3000 L/Ha). Plots were replicated 3 times in a nonrandom design. Treatments were applied June 22. Fungicides and insecticides were applied as required to control scab and insect pests. Mites were removed from leaf samples with a brushing machine and counted under a binocular microscope. Samples of 25 leaves per tree were taken on June 16, July 14, and August 13.

Location: Woodville, Nova Scotia

NAME AND AGENCY:
ROGERS R.E.L. and JOTCHAM, J.R.
Marbicon Biological Consultants
P.O. Box 900, Berwick, Nova Scotia B0P 1E0

RESULTS: The results are summarized in the table below.

Conclusions: All plots had low numbers of mites season long. Savey applied at hatch of first summer eggs of European red mite (ERM) resulted in consistently low numbers of ERM. Although ERM were significantly more abundant in Plictran plots in July there were not significant differences in August. ERM exhibited a trend towards increased abundance over time in the check plots. Two-spotted mites were not detected until August, and they were significantly more abundant in the check plots. Apple rust mite counts in the check plots were significantly higher in August than the other treatments.

			EGGS AND ACTIVE MITES PER LEAF[1,2]		
MITES	TREATMENT	RATE (g ai/ha)	June 16 (pretreatment)	July 14	August 13
European red mite	Check	-	0.27a	1.33a	1.47a
	PLICTRAN 50 WP	1000	0 a	3.20b	0.53a
	SAVEY	50	0.80a	0.80a	0.76a
	SAVEY	100	0 a	0.80a	0.27a
	SAVEY	150	0.27a	0.80a	0.22a
Two-spotted spider mite	Check	-	0 a	0 a	1.56a
	PLICTRAN 50 WP	1000	0 a	0 a	0 b
	SAVEY	50	0 a	0 a	0 b
	SAVEY	100	0 a	0 a	0.27ab
	SAVEY	150	0 a	0 a	0 b
Apple rust mite	Check	-	1.00a	1.67a	3.33a
	PLICTRAN 50 WP	1000	1.00a	1.33a	1.67b
	SAVEY	50	1.00a	1.33a	2.00b
	SAVEY	100	1.00a	1.67a	2.00b
	SAVEY	150	1.00a	2.00a	2.00b

1. Means in each column, for each species, followed by the same letter are not significantly different at the 5% level (LSD test).

2. Apple rust mite was assessed qualitatively on a scale of 1 - 6. (eg. 1 = no mites, 5 = 500-600 mites/leaf (economic threshold)).

CROP: Apple var. Red Delicious

PEST: European red mite, Panonychus ulmi (Koch), twospotted spider mite, Tetranychus urticae Koch

TITLE: EVALUATION OF SAVEY FOR CONTROL OF MITES IN APPLES, 1987.

MATERIALS: SAVEY 50% DF (hexythiazox, DPX-Y5893), PLICTRAN 50 WP (cyhexatin).

METHODS: Treatments were applied to single-tree plots with a hand gun at a pressure of 1300 kPa to wet (approximately 1500 litres per hectare). Plots were replicated four times in a completely randomized design. Treatments were applied on June 23, 1987 at a planned timing of four to five individuals per leaf (all forms). Fungicides and insecticides were applied as required to control apple scab and insect pests. Trees were inspected for the presence of motile and egg stages of Panonychus ulmi and Tetranychus urticae every 10 to 14 days. Mites were removed from samples of 25 leaves per plot using a brushing machine and counted under a binocular microscope.
Location: Milton, Ontario

NAME AND AGENCY:
SMITH, K.W.
Du Pont Canada Agricultural Products
P.O. Box 1630
Guelph, Ontario N1H 6R7

RESULTS: The results are summarized in the table below.

CONCLUSIONS: On the first evaluation date, all treatments showed significantly lower populations of motile and egg forms for both types mites when compared to the check. The final evaluation, made 70 days after application, show the treatments with 100 g ai/ha and 150 g ai/ha of SAVEY giving significantly lower motile populations of both European red and twospotted spider mites versus the treatments of PLICTRAN and the check.

EVALUATION DATE	TREATMENT	RATE g ai/ha	COUNTS PER 25-LEAF SAMPLE: EUROPEAN RED MITE MOTILE	EUROPEAN RED MITE EGGS	TWOSPOTTED SPIDER MITE MOTILE	TWOSPOTTED SPIDER MITE EGGS
July 21, 1987 (28 days after application)	SAVEY	50	6.00 a*	18.00 a	14.50 a	29.00 a
	SAVEY	100	3.00 a	14.25 a	7.75 a	20.75 a
	SAVEY	150	0.25 a	5.75 a	5.75 a	21.75 a
	PLICTRAN	500	6.50 a	6.50 a	58.75 a	18.25 a
	CHECK	-	163.00 b	98.25 b	1518.25 b	207.25 b
	LSD		(65.81)	(66.72)	(938.47)	(125.05)
August 5, 1987 (43 days after application)	SAVEY	50	3.25 ab	19.75 b	0.00 a	0 a
	SAVEY	100	0.00 a	6.25 a	0.25 a	0 a
	SAVEY	150	0.00 a	1.75 a	0.00 a	0 a
	PLICTRAN	500	9.25 b	2.75 a	2.00 a	2.75 a
	CHECK	-	26.50 c	33.00 b	60.75 b	28.75 b
	LSD		(6.04)	(13.27)	(12.28)	(6.77)
September 1, 1987 (70 days after application)	SAVEY	50	21.25 ab	128.50 b	7.25 ab	33.00 a
	SAVEY	100	4.75 a	48.50 a	1.00 a	18.00 a
	SAVEY	150	5.75 a	46.25 a	1.00 a	11.50 a
	PLICTRAN	500	65.25 bc	123.00 b	10.50 b	33.25 a
	CHECK	-	79.00 c	116.00 b	27.00 c	41.75 a
	LSD		(48.20)	(66.95)	(9.26)	(31.50)

* Values followed by the same letter are not significantly different (LSD 0.05)

CROP: Apple var. Red Delicious

PEST: European red mite, Panonychus ulmi (Koch), twospotted spider mite, Tetranychus urticae Koch

TITLE: EVALUATION OF SAVEY FOR CONTROL OF MITES IN APPLES, 1987.

MATERIALS: SAVEY 50% DF (hexythiazox, DPX-Y5893), PLICTRAN 50 WP (cyhexatin).

METHODS: Treatments were applied to single-tree plots with a hand gun at a pressure of 1300 kPa to wet (approximately 1500 litres per hectare). Plots were replicated four times in a completely randomized design. Treatments were applied on June 23, 1987 at a planned timing of four to five individuals per leaf (all forms). Fungicides and insecticides were applied as required to control apple scab and insect pests. Trees were inspected for the presence of motile and egg stages of Panonychus ulmi and Tetranychus urticae every 10 to 14 days. Mites were removed from samples of 25 leaves per plot using a brushing machine and counted under a binocular microscope.
Location: Carlisle, Ontario

NAME AND AGENCY
SMITH, K.W.
Du Pont Canada Agricultural Products
P.O. Box 1630, Guelph, Ontario N1H 6R7

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Throughout the experiment, 100 g ai/ha and 150 g ai/ha of SAVEY significantly lowered the egg population of Tetranychus urticae when compared to the check. At all evaluation dates motile forms of Tetranychus urticae and Panonychus ulmi were significantly lower in all treatments of SAVEY versus the check.

EVALUATION DATE	TREATMENTS	RATE g ai/ha	COUNTS PER 25-LEAF SAMPLE			
			EUROPEAN RED MITE		TWOSPOTTED SPIDER MITE	
			MOTILE	EGGS	MOTILE	EGGS
July 21, 1987 (28 days after application)	SAVEY	50	2.30 a*	57.50 a	2.30 a	29.50 a
	SAVEY	100	1.30 a	11.80 a	5.30 a	25.30 a
	SAVEY	150	6.00 a	22.00 a	4.50 a	27.80 a
	PLICTRAN	500	20.50 a	14.30 a	138.30 a	30.80 a
	CHECK	-	163.30 b	159.30 b	494.30 b	153.50 b
	LSD		(47.45)	(91.57)	(319.50)	(88.69)
August 5, 1987 (43 days after application)	SAVEY	50	1.10 a	3.00 a	0.30 a	8.8 ab
	SAVEY	100	0.00 a	0.00 a	0.00 a	0.5 a
	SAVEY	150	0.00 a	3.50 a	0.00 a	1.5 a
	PLICTRAN	500	9.90 b	25.50 b	34.00 ab	14.5 bc
	CHECK	-	27.30 c	34.30 b	70.30 b	25.3 c
	LSD		(3.72)	(14.02)	(36.48)	(13.00)
September 1, 1987 (70 days after application)	SAVEY	50	37.75 a	200.75 a	15.25 a	77.75 ab
	SAVEY	100	8.75 a	97.25 a	3.25 a	30.00 a
	SAVEY	150	10.00 a	104.75 a	8.50 a	56.25 a
	PLICTRAN	500	179.75 b	275.50 a	67.00 b	78.50 ab
	CHECK	-	165.25 b	280.50 a	74.00 b	150.25 b
	LSD		(71.20)	(191.40)	(38.46)	(81.11)

* Values followed by the same letter are not significantly different (LSD 0.05)

CROP: Apple cv. Northern Spy

PEST: European red mite (ERM), Panonychus ulmi (Koch); two-spotted spider mite (TSSM), Tetranychus urticae Koch

TITLE: EVALUATION OF ACARICIDES FOR THE SEASONAL CONTROL OF MITES.

MATERIAL: APOLLO 50 SC (clofentezine), ETHION 2% SUPERIOR OIL 70, PLICTRAN 50 W (cyhexatin), SAVEY 50 DF (hexythiazox), SUPERIOR OIL 70 SEC.

METHODS: A randomized complete block design, replicated 4 times, was conducted in a 0.4 ha block of apple trees. One- or two-tree plots were used. The trees were planted in 1971 on M9 or M26 rootstocks. Unsprayed guard trees were left between plots to reduce spray drift. Treatments were applied to run-off using a hydraulic hand-gun on a Rittenhouse sprayer operating at 2700 kPa. SUPERIOR OIL and ETHION SUPERIOR OIL were applied on April 22 at the tight cluster stage of bud development. APOLLO, PLICTRAN and SAVEY were applied on May 21 at the calyx stage. The APOLLO, PLICTRAN and SAVEY plots were retreated on July 6 after the number of active mites exceeded the threshold of 7 mites per leaf.

Prespray counts on April 22 were estimated by counting the mites on all the leaves from 40 clusters. These clusters were selected from throughout the experimental area and had an average of 19.6 ERM nymphs per cluster. The mite population on April 27 was estimated by counting the number of mites on all leaves of 5 fruit clusters per plot. On May 19 and June 3, 25 older cluster leaves per plot were examined. On the remaining dates, 25-leaf samples per plot were selected from one half to two thirds the way along the terminal shoots. All samples were examined under a binocular microscope and the various stages of mites were recorded. Two-spotted spider mite populations were reported August 12 and 27 as these were the only dates on which numbers were observed. Mite eggs were not counted in the July 15 and later samples. The oil treatments were not checked after July 15 as they ceased to provide control.

NAME AND AGENCY:
WARNER, J. and COOK, J.M.
Agriculture Canada
Smithfield Experimental Farm
P.O. Box 340, Trenton, Ontario K8V 5R5

RESULTS: Results summarized in the table below.

CONCLUSIONS: SUPERIOR OIL and ETHION SUPERIOR OIL provided equivalent control of ERM in this trial. Although some mite eggs had hatched at the time of application, both oil treatments reduced numbers of nymphs. By July 15, mite numbers in the oil treated plots were similar to those found in the unsprayed control plots.

APOLLO, SAVEY and PLICTRAN significantly reduced mite numbers as compared to the unsprayed control plots. By July 2, mite numbers exceeded the threshold of 7 active mites per leaf. The PLICTRAN, APOLLO and SAVEY plots were retreated on July 6. On July 15, nine days after the second application, mite numbers were below one mite per leaf in all three treatments and remained at this level until the end of July. The August counts showed mite numbers were increasing in the PLICTRAN treated plots. APOLLO and SAVEY provided the longest period of control of ERM. Although two-spotted spider mites appeared in this trial in August, only APOLLO appeared to reduce their numbers.

(Financial contributions from Noram and Dupont in support of this work is appreciated.)

Treatment and formulation	Rate of product/ 100 L	Date of appl.	Apr. 27 ERM nymphs/ cluster	MEAN NUMBER OF EUROPEAN RED MITES PER LEAF									
				May 19		June 3		June 19		July 2		July 15	July 30
				Act.[1]	Eggs	Act.	Eggs	Act.	Eggs	Act.	Eggs	Act.	Act.
Control	-	-	30.9a[2]	8.0a	8.2a	7.2a	27.6ab	4.0a	40.1a	55.4a	45.9a	20.4a	3.0a
SUPERIOR OIL 70 SEC	2.0 L	Apr. 22	1.2b	0.3b	0.9b	1.0b	1.0b	1.2b	20.6a	19.1b	26.1ab	18.0a	
ETHION 2% SUP. OIL 70	2.0 L	Apr. 22	0.7b	0.4b	1.5b	0.5b	0.8b	2.2b	23.7a	24.7b	28.0ab	26.3a	
PLICTRAN		May 21		Prespray									
50 W	37.1 g	July 6		7.3a	10.3a	0.3b	9.1b	0.6b	6.6a	7.4b	11.8b	0.1b	0.4b
APOLLO		May 21											
50 SC	8.3 ml	July 6		5.1a	12.2a	0.1b	24.1b	1.0b	10.8a	11.9b	23.6ab	0.8b	0.3b
SAVEY 50 DF	6.0 g	May 21 July 6		6.1a	12.6a	0.4b	57.4a	1.7b	22.8a	17.0b	28.9ab	0.6b	0.2b

	MEAN NUMBER OF NYMPHS + ADULTS PER LEAF					
	August 12			August 27		
	ERM	TSSM	Total	ERM	TSSM	Total
Control	4.5a	3.1a	7.5a	6.1b	2.1a	8.2b
PLICTRAN 50 W	2.8b	0.7ab	3.5b	14.2a	2.0a	16.2a
APOLLO 50 SC	0.6c	0.2b	0.7c	0.5b	0.4a	0.9b
SAVEY 50 DF	0.3c	0.7ab	1.0c	0.2b	1.5a	1.7b

[1] Act. = actives (nymphs + adults).
[2] Means followed by the same letter in each column are not significantly different using Duncan's multiple range test (P=0.05).

CROP: Apple

PEST: Fruittree leafroller, Archips argyrospila (Walker)

TITLE: ORCHARD EVALUATION OF INSECTICIDES FOR THE CONTROL OF FRUITTREE LEAFROLLER (FTLR) LARVAE.

MATERIALS: Okanagan dormant oil + ETHION 25 WP (ethion), LORSBAN 50 WP (chlorpyrifos), CYMBUSH 12.5 WP (cypermethrin), DIPEL WP (Bacillus thuringiensis), DIPEL 8L (Bacillus thuringiensis).

METHODS: Test materials were applied with an air blast-type sprayer. Each material was applied to 2 replicates of 12-20 trees in a randomized complete block design. Within the Red Delicious blocks, the dormant oil + ETHION was applied at tight cluster (April 15) and the LORSBAN and CYMBUSH tretments at pink (May 1). Within the Golden Delicious blocks, the DIPEL 8L and DIPEL WP were applied at pink (April 20 and May 1 respectively) and the LORSBAN at petal fall (May 13). All efficacy evaluations were conducted on the central trees within each treatment block. At full bloom, the number of FTLR within 50 clusters chosen at random from 5 of the central trees within each treatment were counted. After petal fall, apples in 25 clusters from each of 5 central trees within each treatment were assessed for leafroller damage. All fruit from the central trees was harvested in September and the percentages of early and late season leafroller damage assessed.

NAME AND AGENCY:
COSSENTINE, J.E. and JENSEN, L.B.M.
Agriculture Canada
Research Station
Summerland, British Columbia V0H 1Z0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All of the materials tested in the Red Delicious block significantly ($P < .05$) reduced the early leafroller feeding damage. At 100% bloom in the Golden Delicious block, neither of the 2 DIPEL products had a significant ($P < .05$) effect on the FTLR larvae, however the blossom sample was performed 1 week after their application and the bacterium may not have had time to kill the larvae. Both of the DIPEL products and the LORSBAN significantly ($P < .05$) reduced the FTLR damage in the June cluster samples, however, by harvest this reduction was not observed in the percentages of apples displaying typical early season leafroller damage.

Variety and Treatment	Rate/ha	100% bloom[1] $\bar{x}$ larvae/ 50 clusters	% damaged apples June	Harvest early	Harvest late
Red Delicious					
control	-	54.0 a[2]	20.0 a	19.8 a	4.6 a
CYMBUSH	800 g	26.5 ab	5.3 b	9.4 b	4.4 a
LORSBAN	1.5 kg	5.0 b	4.6 b	10.5 b	1.3 b
oil + ETHION	65 L	8.0 b	3.2 b	7.4 b	2.1 b
Golden Delicious					
control	-	6.5 a	7.6 a	1.6 a	7.2 a
LORSBAN	1.5 kg	-	1.5 b	0.5 a	0.4 c
DIPEL 8L	2.8 L	11.5 a	0.8 b	1.3 a	2.3 b
DIPEL WP	2.5 kg	3.0 a	0.01 b	1.2 a	1.7 b

[1] percentages analysed after arcsin transformation

[2] means within apple varieties and columns followed by the same letter are not significantly ($P = .05$) different as determined by Duncan's multiple range test

CROP: Apple cv. Empire

PEST: Mullein plant bug, *Campylomma verbasci* (Meyer)

TITLE: EVALUATION OF INSECTICIDES FOR MULLEIN PLANT BUG CONTROL.

MATERIALS: LANNATE 215 g ai/L L (methomyl), DIAZINON 50 WP (diazinon), GUTHION 50 WP (azinphosmethyl), CARZOL 92 SP (formetanate hydrochloride), POUNCE 384 g ai/L EC (permethrin), BELMARK 300 g ai/L EC (fenvalerate).

METHODS: Plots were arranged according to a randomized complete block design in a five-year-old commercial block of apples cv. 'Empire' near Vittoria, Ont. Tree spacing was 3.35 m by 6.1 m. Treatments were replicated four times and assigned to single-tree plots. Plots were sprayed using a truck-mounted sprayer equipped with a Spraying Systems handgun fitted with a D-6 orifice plate. Pressure was set at 1379 kPa and trees were sprayed on May 27 until runoff (ca. 5 L/tree). Materials were diluted to a rate comparable to 3370 L of water per ha. Plots were sampled (prespray) May 27 by tapping. A white cotton tray 46 cm by 46 cm was held under a branch and the branch above the tray struck twice with a stick. Thirty trees were randomly selected throughout the block and each tree sampled once (1 tap/tree). The number of bugs falling onto the cotton tray were recorded. Plots were sampled postspray on June 5 when each plot was tapped six times and the number of nymphs and adults caught on the cotton tray recorded. Fifty fruit/plot were also examined for mullein plant bug injury. Data were analyzed using an analysis of variance and means compared with a Duncan's multiple range test at the 0.05 significance level.

NAME AND AGENCY:
MARSHALL, D.B. and PREE, D.J.
Agriculture Canada, Research Station
VINELAND STATION, Ontario LOR 2E0
FISHER, P.
Horticultural Experimental Station
Plant Industry Branch, OMAF
Simcoe, Ontario, N3Y 4N5

RESULTS: As presented in the table below.

CONCLUSIONS: All materials significantly reduced the number of mullein bugs below the control. Plots treated with LANNATE, DIAZINON, and GUTHION had the fewest mullein plant bugs, but not significantly fewer than plots treated with CARZOL, POUNCE or BELMARK. None of the plots had fruit damaged by mullein plant bug.

Treatment (May 27)	g ai/ha	Mullein plant bugs/plot (June 5)
LANNATE L	1451.3	0.25 a[1]
DIAZINON 50 WP	1625.0	0.25 a
GUTHION 50 WP	1300.0	0.25 a
CARZOL 92 SP	1012.0	0.50 a
POUNCE 384 EC	199.7	0.50 a
BELMARK 300 EC	135.0	1.33 a
Control	--	4.00 b

[1] means followed by the same letter not significantly different ($P < 0.05$, Duncan's multiple range test).

CROP: Apple cv. Red Delicious

PEST: Mullein plant bug, Campylomma verbasci (Meyer)

TITLE: COMPARISON OF INSECTICIDES FOR CONTROL OF CAMPYLOMMA VERBASCI.

MATERIALS: SUMITHION 50EC (fenitrothion), LANNATE L 215 g a.i./L (methomyl), LORSBAN 50WP (chlorpyrifos), SUPRACIDE 25EC (methidathion), DIAZINON 50WP (diazinon), CYGON 480EC (dimethoate) and GUTHION 50WP (azinphos-methyl).

METHODS: The orchard used in this test was 18 years old, planted on M26 rootstocks 4.9 m between rows and 4.25 m between trees. The orchard was divided into 9 plots of 25 trees (5 x 5). The treatments, listed in the Table below, were allocated in a randomized plot design, one plot per treatment except for the check for which there were two plots. The treatments were applied 8 May with a low volume air-blast type sprayer calibrated to deliver 625 L/ha. On this date petal-fall of blossoms was about 95 percent completed. Pre- and posttreatment samples for C. verbasci nymphs were taken using a 45 x 45 cm cloth covered beating tray on the dates given in the Table below. Twenty limbs were sampled at random from 6 trees in the center of each block. The outer trees in each block were used as guard trees.

NAME AND AGENCY:
McMULLEN, R.D. and JONG, C.
Agriculture Canada
Research Station
Summerland, British Columbia V0H 1Z0

RESULTS: See table below.

CONCLUSIONS: All of the treatments except GUTHION provided excellent control of C. verbasci.

Material	Rate per ha	Total no. nymphs/20 samples	
		May 7 prespray	May 13 postspray
SUMITHION 50EC	4.0 L	84	0
LANNATE L	9.1 L	128	0
LORSBAN 50WP	3.4 kg	254	0
SUPRACIDE 25EC	11.0 L	163	0
DIAZINON 50WP	4.5 kg	364	0
CYGON 480EC	2.25 L	54	0
GUTHION 50WP	2.8 kg	194	50
Check (no treatment)	--	164.5*	71*

* Average of 2 replicates.

CROP: Apple var. McIntosh

PEST: Pale apple leafroller, Pseudexentera mali Freeman.

TITLE: 1987 EVALUATION OF INSECTICIDES APPLIED AT CALYX AGAINST PALE APPLE LEAFROLLER.

MATERIALS: GUTHION 50 WP (azinphos-methyl), GUTHION 35 WP (azinphos-methyl), GUTHION 360 F (azinphos-methyl), CYMBUSH 12.5 WP (cypermethrin), DECIS 2.5 EC (deltamethrin), POUNCE 384 EC (permethrin), DIPEL WP (Bacillus thuringiensis var. kurstaki Berliner), HOE 000522 15 F (teflubenzuron), ALSYSTIN 480 F (triflumuron, CYGON 480 EC (dimethoate), BRIGADE 10 WP (bifentin), KARATE 50 EC (cyhalothrin), DIMILIN 25 WP (diflubenzuron), CAPTAN 50 WP (captan).

METHODS: Most treatments were applied to two tree plots with a hand-held gun at pressure of 2800 kPa to runoff, 8 June. The DIMLIN and CYMBUSH + DIPEL treatments were applied 11 June. Samples, consisting of 10 injured clusters from each of 2 trees per treatment, were taken 10, 12, and 15 June. PALR larvae were removed from samples and recorded as alive or dead.

NAME AND AGENCY:
HARDMAN, John Michael
Agriculture Canada Research Station
Kentville, N.S. B4N 1J5

RESULTS: The results are summarized in the tables below.

CONCLUSION: CYMBUSH, POUNCE (7.9 mL/100 L), and BRIGADE gave effective control of PALR: with all 3 treatments there were fewer than 6 live PALR larvae totalled over the 3 sampling dates. GUTHION 50 WP, DECIS, and the POUNCE/DIPEL mixture gave partial control (fewer than 10 live PALR larvae totalled over the 3 sampling dates).

No. of PALR larvae

Treatment	Rate /100 L	10 June Live	10 June Dead	12 June Live	12 June Dead	15 June Live	15 June Dead
GUTHION 50 WP	60.6 g	3	4	2	0	4	1
GUTHION 35 WP	87.0 g	3	6	4	1	3	0
GUTHION 360 F	85.0 mL	6	0	3	1	2	0
CYMBUSH 12.5 WP	24.0 g	0	6	0	2	0	0
CYMBUSH 12.5 WP[1]	1.7 g			4	0	3	0
+ DIPEL WP	16.0 g						
DECIS 2.5 EC	10.0 mL	1	2	4	0	3	1
POUNCE 384 EC	7.9 mL	1	4	1	1	0	0
POUNCE 384 EC[1]	1.6 mL	5	1	1	0	3	0
+ DIPEL WP	33.0 g						
HOE 000522 15 F	24.2 mL	8	0	8	0	4	0
ALSYSTIN 480 F	31.0 mL	9	3	8	0	8	0
DIMILIN 25 WP	40.0 g			9	0	7	0
CYGON 480 EC	31.0 mL	9	0	5	1	3	4
BRIGADE 10 WP	7.6 g	1	3	3	0	1	2
KARATE 50 EC	0.8 mL	6	3	6	0	4	5
Check #1		10	0	7	0	8	0
Check #2		1	0	7	0	6	1

1. Each mixture with DIPEL included 200 g of CAPTAN 50 WP/100 L because of the spreader/sticker included in the formulation.

CROP: Apple var. Red Delicious

PEST: Rosy apple aphid (RAA), Dysaphis plantaginea (Passerini), codling moth (CM), Cydia pomonella (L.), apple brown bug (ABB), Atractotomus mali (Meyer), mullein bug (MB), Campylomma verbasci (Meyer), European red mite (ERM), Panonychus ulmi Koch, apple rust mite (ARM), Aculus schlechtendali (Nalepa), lemon-yellow mite (LY) Zetzellia mali (Ewing) and Typhlodromus species (TP).

TITLE: 1987 EVALUATIONS OF DIMILIN/APOLLO MIXTURES APPLIED AT TIGHT CLUSTER AND CALYX

MATERIAL: DIMILIN 25 WP (diflubenzuron), APOLLO 50 SC (clofentezine).

METHODS: Treated 8 tree plots 11 May (tight cluster) or 3 June (calyx) with a hand-held gun at a pressure of 2800 kPa to runoff. Samples of 4 clusters per tree (2 trees per treatment) were taken 16 June, 8 and 29 July, 13 and 25 August. Leaves were brushed and counted and mite densities were estimated on a per leaf basis. Samples of 100 apples per tree (6 check trees and 5 trees per treated plot) were examined the last week in September and the first week in October for insect injury to fruit.

NAME AND AGENCY:
HARDMAN, John Michael
Agriculture Canada Research Station
Kentville, N.S. B4N 1J5

RESULT: CM deep entries were in 0.9% of the fruit in the check plot while 1.2% of the fruit in the plot treated 11 May with DIMILIN and APOLLO (36mL/400 L) had RAA injury. ABB + MB injury was 5.0% in the check plot and varied from 1.1 to 2.5% in the treated plots. Mite results are summarized in the table below.

CONCLUSIONS: Densities of ERM stayed below the economic threshold (10 motiles plus eggs per leaf) through the season in those plots where DIMILIN and APOLLO were applied at calyx. In plots treated at tight cluster, ERM densities had risen slightly above threshold by mid August, but fell to subeconomic levels later that month. Treatments had an occasional slight impact on ARM, but enough of these mites survived to provide a good source of alternate prey for the typhlodromid predators. Typhlodromus sp. were found both in the control plot and in most of the treated plots. LY's were found in the check plot and in one of the plots treated at tight cluster.

Date	Treatments + Rates per 400 L	No. of mites + eggs per leaf			
		ERM	ARM	TP	LY
16 June	DIMILIN tc[1] 160 g + APOLLO 54 mL	0.8 b	1.2 a	0.3 a	0.0 a
	DIMILIN tc 160 g + APOLLO 36 mL	0.8 b	5.8 a	0.0 a	0.0 a
	Check	32.3 a	11.4 a	0.2 a	0.0 a
8 July	DIMILIN tc 160 g + APOLLO 54 mL	1.3 b	60.5 a	0.0 a	0.0 a
	DIMILIN tc 160 g + APOLLO 36 mL	1.5 b	129.8 a	0.0 a	0.0 a
	DIMILIN c[2] 160 g + APOLLO 54 mL	3.6 b	32.5 a	0.0 a	0.0 a
	DIMILIN c 160 g + APOLLO 36 mL	4.7 b	48.0 a	0.0 a	0.0 a
	Check	69.6 a	144.9 a	0.0 a	0.0 a
29 July	DIMILIN tc 160 g + APOLLO 54 mL	7.3 b	361.5 a	0.0 a	0.0 a
	DIMILIN tc 160 g + APOLLO 36 mL	6.5 b	195.1 b	0.0 a	0.2 a
	DIMILIN c 160 g + APOLLO 54 mL	4.0 bc	163.2 b	0.0 a	0.0 a
	DIMILIN c 160 g + APOLLO 36 mL	0.3 c	159.4 b	0.0 a	0.0 a
	Check	41.7 a	410.0 a	0.2 a	1.1 a
13 August	DIMILIN tc 160 g + APOLLO 54 mL	14.0 a	44.3 ab	0.0 a	0.0 a
	DIMILIN tc 160 g + APOLLO 36 mL	17.4 a	30.6 b	0.0 a	0.6 a
	DIMILIN c 160 g + APOLLO 54 mL	0.6 bc	95.7 a	0.0 a	0.0 a
	DIMILIN c 160 g + APOLLO 30 ml	0.0 c	59.6 ab	0.0 a	0.0 a
	Check	7.3 ab	19.5 b	0.0 a	0.2 a
25 August	DIMILIN tc 160 g + APOLLO 54 mL	1.3 ab	0.9 a	4.2 a	0.0 a
	DIMILIN tc 160 g + APOLLO 36 mL	1.6 ab	2.8 a	0.0 b	0.0 a
	DIMILIN c 160 g + APOLLO 54 mL	0.3 b	0.8 a	0.7 b	0.0 a
	DIMILIN c 160 g + APOLLO 36 mL	0.3 b	2.8 a	0.5 b	0.0 a
	Check	3.3 a	2.1 a	0.0 b	0.0 a

Means within columns on the same date followed by the same letter are not significantly different ($P>0.05$) as determined by Tukey's Studentized range test after square root transformation of the data.

1. tc Appliction at tight cluster
2. c Application at calyx

CROP: Apple cv. McIntosh

PEST: San Jose Scale, Quadraspidiotus perniciosus (Comstock)

TITLE: ORCHARD COMPARISON OF DORMANT VERSUS DEGREE-DAY TIMED SUMMER SPRAYS FOR CONTROL OF SAN JOSE SCALE.

MATERIALS: BASUDIN 50 WP (diazinon), LORSBAN 50 WP (chlorpyrifos), SUPRACIDE 240 EC (methidathion).

METHODS: A planting of 25-year-old McIntosh apple trees on Malling VII rootstock and planted 2.25 x 4.5 m was used in a completely randomized experimental design. There were 3 plots of 3 trees each for each treatment. Guard trees were left between adjacent plots and guard rows were left between treatment rows. SUPRACIDE (5.5 L/ha) was applied at the tight cluster stage of bud development (on 87.04.09), LORSBAN (1.12 kg/ha) was applied at petal fall (on 87.05.05) and BASUDIN (5.5 kg/ha) at either 200, 300 or 400 degree-days (DD) (10.5 degree C base) after the capture of the first San Jose scale male on a pheromone trap baited with synthetic pheromone. Control plots were left unsprayed and the block was sprayed 3 times during the summer with GUTHION 50 WP (azinphosmethyl) (1.4 kg/ha) for codling moth control. All applications were made using a hydraulic boom sprayer operating at 1.9 km/h and set to deliver 2509 L/ha. The relative effectiveness of the treatments was measured by randomly sampling between 400 and 500 apples from each plot during the normal harvest period (87.09.08) and counting the total number of apples with 1 or more scale on them.

NAME AND AGENCY:
ANGERILLI, N.P.D., FITZGIBBON, F. and THOMSON, D.
Agriculture Canada
Research Station
Summerland, British Columbia V0H 1Z0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: None of the treatments used produced scale infested fruit significantly different than the untreated control plots in this heavily scale infested orchard, though SUPRACIDE and the 200 and 300 DD post first male sprays were significantly better than either LORSBAN or the 400 DD spray. Degree-day timed sprays deserve further investigation as adjuncts to conventional control programs for this pest.

Treatment	Mean % infested fruit
BASUDIN at 400 DD	95.6 a *
LORSBAN	93.4 a
Control	71.9 ab
BASUDIN at 300 DD	46.7 b
BASUDIN at 200 DD	36.6 b
SUPRACIDE	33.7 b

* Means not followed by the same letter are significantly different (ANOVA, LSD p = 0.05). Data were transformed to ARCSIN (x) prior to analysis.

CROP: Apple cv. McIntosh

PEST: San Jose Scale, *Quadraspidiotus perniciosus* (Comstock)

TITLE: SAN JOSE SCALE CONTROL WITH APPLICATIONS OF DORMANT OIL AND DORMANT OIL WITH LORSBAN.

NAME AND AGENCY:
MARSHALL, D.B. and PREE, D.J.
Agriculture Canada, Research Station
VINELAND STATION, Ontario L0R 2E0

MATERIALS: Superior oil (70 vis), LORSBAN 480 g a.i. L^{-1} EC (chlorpyrifos).

METHODS: Treatments were replicated five times, assigned to single-tree plots and organized according to a randomized complete block design in a 23-year-old orchard cv. 'McIntosh' with row spacings 8.2 m by 8.2 m. Applications were made using a truck-mounted sprayer equipped with a Spraying Systems handgun fitted with a D-6 orifice plate. Pressure was set at 1379 kPa. Materials were diluted to a concentration comparable to 3370 L of water/ha and sprayed until runoff (11-12 L/plot) on April 23. Apple bud stage development was green tip to ½ inch green. On Sept. 9, 120 fruit were randomly picked from the tree canopy. Percentage fruit infested with San Jose scale (SJS) was transformed using an Arcsin transformation and means were separated using an analysis of variance and Duncan's multiple range test at the 0.05 significance level.

RESULTS: As presented in the table below.

CONCLUSIONS: The percentage of infested fruit was significantly higher in the control plots than in the treated plots. Plots treated with Superior oil 70 with LORSBAN 480 EC had the lowest percentage of infested fruit but insignificantly lower than Superior oil 70 treated plots.

Treatment (applied April 23)	Rate ha^{-1}	% fruit with SJS (Sept. 9)
LORSBAN 4E with Superior oil (70 vis)	4166.9 ml with 67.4 L	7.3 a[1]
Superior oil (70 vis)	65.0 L	16.5 a
Control	--	57.5 b

[1] means followed by the same letter not significantly different ($P < 0.05$, Duncan's Multiple range test).

CROP: Apple

PEST: Speckled green fruitworm, Orthosia hibisci (Guenee)

TITLE: ORCHARD EVALUATION OF INSECTICIDES FOR THE CONTROL OF SPECKLED GREEN FRUITWORM (GFW) LARVAE.

MATERIALS: dormant oil, GUTHION 50 WP (azinphosmethyl), BASUDIN 50 WP (diazinon).

METHODS: Treatments were applied with an air blast sprayer to 34-60 Spartan and McIntosh trees, in 2 replications in a randomized complete block design. Dormant oil and oil + GUTHION treatments were applied at tight cluster and GUTHION and BASUDIN treatments at early pink (P). Two blocks served as a replicated control until they were treated at petal fall (PF) with BASUDIN, as were the blocks that had been treated with oil alone at tight cluster. At full bloom, the number of GFW was assessed within 50 clusters chosen randomly from each of 5 of the central trees in each treatment. In June, the percentage of apples displaying feeding damage was determined from 25 clusters chosen at random from each of 5 central trees per treatment. The percentage of fruit with lepidopteran feeding damage was assessed at harvest by observing 150 apples per bin of harvested fruit. Due to low crop volume in one replication of each of the oil at tight cluster and the BASUDIN at early pink treatments, these 2 treatments were removed from the analysis of damage at harvest.

NAME AND AGENCY:
COSSENTINE, J.E. and JENSEN, L.B.M.
Agriculture Canada
Research Station
Summerland, British Columbia V0H 1Z0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All but the dormant oil treatment significantly ($P < .05$) reduced the number of GFW at full bloom compared to the control [as yet untreated BASUDIN (PF)]. Once treated, this BASUDIN treatment did not display a significantly ($P < .05$) higher percentage of damaged apples in June. The lepidopteran feeding damage observed at harvest is a more thorough assessment of the GFW damage. At harvest, the earlier applied sprays of oil + GUTHION and GUTHION alone controlled the feeding damage significantly ($P < .05$) better than did the petal fall treatment of BASUDIN.

Treatment	Rate/ha	Full bloom $\bar{x}$ larvae/ 50 clusters	% damaged apples[2]	
			June	Harvest
BASUDIN (PF)	2.75 kg	1.5 a[1]	6.7 a	8.4 a
Dormant oil	65 L	0.5 ab	2.5 a	-
Oil + GUTHION	65 L	0 b	1.7 a	6.2 b
GUTHION	2.75 kg	0 b	6.1 a	5.8 b
BASUDIN (P)	4.5 kg	0 b	3.0 a	-

1 Means within columns followed by the same letter are not significantly ($P \leq .05$) different as determined by Duncan's multiple range test.

2 Percentages analyzed after arcsin transformation.

CROP: Apple var. McIntosh

PEST: Spotted tentiform leafminer (STLM) Phyllonorycter blancardella (Fabr.).

TITLE: 1987 EVALUATION OF INSECTICIDES APPLIED AGAINST SECOND GENERATION SPOTTED TENTIFORM LEAFMINER.

MATERIALS: GUTHION 50 WP (azinphos-methyl), GUTHION 35 WP (azinphos-methyl), GUTHION 360 F (azinphos-methyl), CYMBUSH 12.5 WP (cypermethrin), DECIS 2.5 EC (deltamethrin), POUNCE 384 EC (permethrin), DIPEL WP (Bacillus thuringiensis var. kurstaki Berliner), HOE 000522 15 F (teflubenzuron), ALSYSTIN 480 F (triflumuron), CYGON 480 EC (dimethoate), BRIGADE 10 WP (bifentin), KARATE 50 EC (cyhalothrin), DIMILIN 25 WP (diflubenzuron), RIPCORD 400 EC (cypermethrin), CAPTAN 50 WP (captan).

METHODS: Treatments were applied to two tree plots with a hand-held gun at a pressure of 2800 kPa to runoff, 16 July.

NAME AND AGENCY:
Hardman, John Michael
Agriculture Canada Research Station
Kentvile, N.S. B4N 1J5

Samples consisting of 4 clusters from each of 2 trees per treatment, were taken 27 July, 18 August, and 2 September. From these samples 25 leaves were taken and the number of mines with live larvae and the number of hymenopterous parasites was recorded.

RESULTS: The results are summarized in the tables below.

CONCLUSIONS: GUTHION 50 WP, CYMBUSH + DIPEL, POUNCE + DIPEL, and CYGON gave economic control (less than 1 live larva per leaf) to mid August followed by a rise to economic levels of STLM in early September. RIPCORD, RIPCORD + DIPEL, DECIS, POUNCE, HOE 000522, ALSYSTIN, BRIGADE and DIMILIN kept STLM below the economic threshold. Parasitism of STLM was heavy-0.2 to 1 hymenopterous parasite per leaf-for all dates and all treatments.

Treatment[1]	/100 L	No. of live STLM larvae on 25 leaves 27 July	18 August	2 September
GUTHION 50 WP	60.6 g	0	3	58
GUTHION 35 WP	87.0 g	39	5	82
GUTHION 360 F	85.0 mL	39	1	90
CYMBUSH 12.5 WP	24.0 g	11	3	10
CYMBUSH 12.5 WP[1]	1.7 g	0	13	27
+ DIPEL WP	16.0 g			
RIPCORD 400 EC	7.6 mL		9	13
RIPCORD 400 EC[1]	0.8 mL	3	4	14
+ DIPEL WP	16.0 g			
DECIS 2.5 EC	10.0 mL	6	16	13
POUNCE 384 EC	7.9 mL	8	2	1
POUNCE 384 EC[1]	1.6 mL	2	3	31
+DIPEL WP	33.0 g			
HOE 000522 15 F	24.2 mL	3	0	0
ALSYSTIN 480 F	31.0 mL	1	6	0
ALSYSTIN 480 F	15.6 mL	3	0	0
CYGON 480 EC	63.0 mL	3	15	29
BRIGADE 10 WP	7.6 g	26	11	15
KARATE 50 EC	0.8 mL	3	3	1
DIMILIN 25 WP	40.0 g	3	13	2
Check #1		2	5	150
Check #2		3	41	125

1. Each mixture with DIPEL included the recommended rate of CAPTAN 50 WP because of the spreader/sticker included in the formulation.

CROP: Apple cv. McIntosh

PEST: Spotted Tentiform Leafminer, Phyllonorycter blancardella (Fabr.)

TITLE: EVALUATION OF MATERIALS APPLIED FOR SECOND GENERATION SPOTTED TENTIFORM LEAFMINER.

MATERIALS: HOE 000522 150 g. a.i./L.F (teflubenzuron), SUMITHION 40 W (fenitrothion), BASF 166 801 100 g a.i./L SC.

METHODS: Treatments were replicated four times and assigned to single tree plots according to a randomized complete block design in a 23-year-old planting of McIntosh in the Jordan area. Tree spacing was 8.2 m by 8.2 m. Materials were applied using a truck-mounted sprayer equipped with a Spraying Systems handgun fitted with a D-6 orifice plate. Pressure was set at 1379 kPa and plots were sprayed until runoff (15 to 17.5L/tree) on June 25 (when STLM were late instars to emerged adults and timed for 1st egg deposition by second generation moths). Plots were first sampled for STLM June 24 (prespray) when 5 fruit spur leaf clusters/plot were taken from the lower part of the tree canopy (1 to 2 m high). Clusters were examined with a binocular microscope and the number of various STLM life stages and parasites (Pholotesor ornigis and Chalcid species) recorded. Plots were again sampled Aug. 21 and on Oct. 5 when 25 leaves/plot were taken and examined. Plots were sampled Aug. 24 for European red mite (ERM) eggs and active stages, and Phytoseiid and Stigmaeid predators. Fifty leaves were picked/plot and five of these leaves were examined under a microscope.

NAME AND AGENCY:
MARSHALL, D.B. and PREE, D.J.
Agriculture Canada, Research Station
VINELAND STATION, Ontario LOR 2E0

The remaining 45 were brushed using a Henderson-McBurnie mite brushing machine. On Sept. 1, the degree of 'bronzing' of the foliage by ERM and TSSM feeding was rated on a scale of 0 to 10 (10 being the most severe) for each plot. Data were analysed using an analysis of variance and Duncan's multiple range test at the 0.05 level of significance.

RESULTS: As presented in the table below.

CONCLUSIONS: There were no significant differences in numbers of STLM/plot between plots sampled prespray June 24. Similarly, numbers of parasites/plot were similar for all plots prespray. In the sample taken Aug. 21 there were no differences between STLM numbers/plot, but numbers of parasites in the HOE 00522 treated plots were significantly lower. By Oct. 5 STLM numbers in the HOE 00522 treated plots were significantly less than in other plots. Plots treated with BASF 166 801 (1.75/leaf) had significantly fewer STLM than SUMITHION or untreated control plots (both with 3.0/leaf). The highest number of parasites was found in the untreated control plots. Samples picked Aug. 24 for ERM showed no statistical differences in numbers of eggs, actives, or predators between plots. Observations on Sept. 1 showed very little 'bronzing' of foliage.

Treatment (June 25)	Rate g a.i./ha.	June 24 (prespray) STLM/ cluster	June 24 (prespray) Parasites[1]/ cluster	Aug. 21 STLM/leaf	Aug. 21 Parasites/leaf	Oct. 5 STLM/leaf	Oct. 5 Parasites/leaf
HOE 000522 150F	80.0	0.30a[2]	0.70a	0.43a	0.08 b	0.56a	0.11a
BASF 166 801 100SC	505.5	0.35a	0.70a	0.90a	0.43a	1.75 b	0.44ab
SUMITHION 40WP	1500.0	0.45a	0.35a	1.39a	0.55a	3.00 c	0.75 bc
CONTROL	-	0.25a	0.70a	0.80a	0.77a	3.00 c	1.02 c

Treatment (June 25)	Rate g a.i./ha.	Aug. 24 ERM/leaf eggs	Aug. 24 ERM/leaf actives	Aug. 24 Phytos/ leaf	Aug. 24 Zetzellia/ leaf	Sept.1 Bronzing Rating
HOE 000522 150F	80.0	0.95a	0.51a	0.13a	0.06a	1.25a
BASF 166 801 100SC	505.5	0.56a	0.47a	0.10a	0.00a	1.75a
SUMITHION 40WP	1500.0	1.50a	0.74a	0.40a	0.10a	1.75a
CONTROL	-	1.07a	0.36a	0.14a	0.04a	1.25a

[1] includes Pholotesor ornigis and Chalcids.
[2] means followed by the same letter not significantly different (P< 0.05, Duncan's multiple range test).

CROP: Apple cv. McIntosh

PEST: Spotted Tentiform Leafminer, Phyllonorycter blancardella (Fabr.)

TITLE: EVALUATION OF INSECTICIDES FOR CONTROL OF SPOTTED TENTIFORM LEAFMINER.

MATERIALS: GUTHION 50 WP (azinphosmethyl), SUMITHION 40 WP (fenitrothion), BRIGADE 10 WP (bifenthrin), KARATE 50 g a.i./L EC (lambda cyhalothrin), DANITOL 300 g a.i./L EC (fenpropathrin).

METHODS: Treatments were replicated four times and assigned to single-tree plots according to a randomized complete block design in a 23-year-old planting of McIntosh in the Jordan area. Tree spacing was 8.2 m by 8.2 m. Materials were applied using a truck-mounted sprayer equipped with a Spraying Systems handgun fitted with a D-6 orifice plate. Pressure was set at 1379 kPa and plots were sprayed on May 21 until runoff (15 - 17.5 L/plot). Plots were first sampled for spotted tentiform leafminer (STLM) May 8 when 30 fruit spur leaf clusters were randomly taken from the lower central portion of the tree canopy (one leaf cluster/tree). Samples for STLM were picked throughout the block May 11 (30 clusters) and May 19 (35 clusters). On June 8 samples were taken for STLM (10 clusters from the lower tree canopy) and European red mite (ERM) (5 clusters). Samples were examined under a binocular microscope and the numbers of various STLM life stages and parasites (Pholotesor ornigis and Chalcid species) and numbers of ERM eggs, actives, and Phytoseiid predators recorded. Plots were again sampled June 18 (20 clusters/plot), July 30 (40 leaves/plot) and September 30 (25 leaves/plot) for STLM life stages and parasites. Fifty leaves/plot were picked Aug. 28 and examined under a binocular microscope for ERM and two-spotted spider mite (TSSM) life stages and the predators belonging to Phytoseiid and Stigmaeid families. Five leaves were examined under a microscope and the remaining 45 were brushed using a Henderson-McBurnie mite brushing machine. On Sept. 1, 'bronzing' of the foliage caused by ERM and TSSM feeding was rated on a scale of 0 to 10 (10 being the most severe) for each plot. Data were analysed using an analysis of variance and Duncan's multiple range test at the 0.05 level of significnace.

NAME AND AGENCY:
MARSHALL, D.B. and PREE, D.J.
Agriculture Canada, Research Station
VINELAND STATION, Ontario L0R 2E0

RESULTS: As presented in the table below.

CONCLUSIONS: By June 8, the pyrethroids KARATE, DANITOL, and BRIGADE significantly lowered numbers of STLM compared to the untreated control plots. Similar numbers of parasites (P. ornigis and Chalcids) were found in all plots. In the samples June 18 and July 30, the pyrethroid-treated plots had signficantly fewer STLM than other plots. The fewest parasites were also found in pyrethroid-treated plots. In the Sept. 30 sample significantly lower numbers of STLM were found in the KARATE-treated plots than in plots receiving treatments of DANITOL, GUTHION, SUMITHION, or untreated control plots. The number of parasites could be related to the number of STLM hosts available in most samples. The sample taken June 8 for ERM showed few Phytoseiids in the pyrethroid-treated plots. These plots also had the highest numbers of ERM Aug. 28. Numbers of the Stigmaeid predator Zetzellia mali (Ewing) were highest in pyrethroid-treated plots. SUMITHION, GUTHION, and untreated control plots had foliage which remained green season long while pyrethroid-treated plots were bronzed significantly (Sept. 1 rating).

OBSERVATIONS: In the May 8 sample 18 eggs were found on 30 fruit spur leaf clusters. 32 eggs (3 hatched) were found on the 30 spurs picked May 11, and 16 eggs (7 hatched) on the 35 spurs May 19.

Treatment May 21	Rate g a.i./ha.	June 8 STLM/cluster	June 8 Parasites[1]/cluster	June 18 STLM/cluster	June 18 Parasites/cluster	July 30 STLM/cluster	July 30 Parasites/clusters	Sept. 30 STLM/25 leaves	Sept. 30 Parasites/25 leaves
KARATE 50EC	10.0	0.08a[2]	0.08a	0.08a	0.09a	0.09a	0.03a	3.75a	0.25a
DANITOL 300EC	100.0	0.08a	0.08a	0.03a	0.08a	0.28ab	0.12ab	44.75 bc	3.50ab
BRIGADE 10WP	24.0	0.25ab	0.10a	0.11a	0.13ab	0.15ab	0.08a	15.75ab	0.50a
SUMITHION 40WP	700.0	0.63 bc	0.25a	0.43 b	0.54 d	0.72 c	0.35 c	45.50 bc	2.75ab
GUTHION 50WP	1053.1	0.70 bc	0.18a	0.28 b	0.31 bc	0.44 bc	0.43 c	51.00 c	5.00 b
CONTROL	-	0.85 c	0.25a	0.33 b	0.46 cd	0.73 c	0.27 bc	60.75 c	3.25ab

Treatment	Rate g a.i./ha.	June 8 ERM/cluster eggs	June 8 ERM/cluster actives	June 8 Phytos/cluster	Aug. 28 ERM/leaf eggs	Aug. 28 ERM/leaf actives	Aug. 28 TSSM/leaf eggs	Aug. 28 TSSM/leaf actives	Aug. 28 Phytos/leaf	Aug. 28 Zetzellia/leaf	Sept.1 Bronzing Rating
KARATE 50EC	10.0	12.20a	4.4 b	0.00a	3.66ab	9.55a	1.05a	7.05a	1.00a	1.89a	7.75a
DANITOL 300EC	100.0	2.05 c	0.65 b	0.00a	4.55a	5.85a	0.34a	0.52a	0.40ab	1.46ab	4.96 b
BRIGADE 10WP	24.0	7.80abc	6.8 ab	0.10a	2.43abc	4.01a	7.55a	11.66a	0.19 b	1.36ab	5.70ab
SUMITHION 40WP	700.0	12.35a	7.5 ab	0.25a	0.66 bc	0.48a	3.35a	3.58a	0.38ab	0.46ab	1.65 c
GUTHION 50WP	1053.1	11.0 ab	15.65a	0.40a	0.46 c	0.10a	3.68a	1.64a	0.30ab	0.21 b	2.10 c
CONTROL	-	2.80 bc	2.0 b	0.55a	0.88 bc	0.82a	2.08a	1.45a	0.56ab	0.14 b	1.05 c

[1] includes Pholotesor ornigis and Chalcids.
[2] means followed by the same letter not significantly different ($P < 0.05$, Duncan's multiple range test).

CROP: Apple cv. McIntosh

PEST: Spotted Tentiform Leafminer, Phyllonorycter blancardella (Fabr.)

TITLE: EVALUATION OF INSECT GROWTH REGULATORS FOR CONTROL OF SPOTTED TENTIFORM LEAFMINER.

MATERIALS: HOE 000522 150 g a.i./L F (teflubenzuron), DIMILIN 25WP (diflubenzuron), CARZOL 92SP (formetanate hydrochloride), BASF 166 801 100 g a.i./L SC.

METHODS: Treatments were replicated four times and assigned to single-tree plots according to a randomized complete block design in a 23-year-old planting of McIntosh in the Jordan area. Tree spacing was 8.2 m by 8.2 m. Materials were applied using a truck-mounted sprayer equipped with a Spraying Systems handgun fitted with a D-6 orifice plate. Pressure was set at 1370 kPa and plots were sprayed on May 8 until runoff (ca. 14 L/tree). Fruit buds were at full pink. Plots were first sampled for spotted tentiform leafminer (STLM) May 5, and again May 8 when 30 fruit spur leaf clusters were randomly taken from the lower central portion of the tree canopy (one leaf cluster/plot). On June 1 samples were taken for STLM (10 clusters/plot from the lower tree canopy) and European red mite (ERM) (5 clusters/plot). Samples were examined under a binocular microscope and the numbers of various STLM life stages and parasites (Pholotesor ornigis and Chalcid species) and numbers of ERM eggs, actives, and predacious mites were recorded. Plots were again sampled June 29 (20 clusters/plot), Aug 13 (54 leaves/plot) and Oct 5 (25 leaves/plot) for STLM life stages and parasites. Fifty leaves/plot were picked Aug. 26 and examined under a binocular microscope for ERM and two-spotted spider mites (TSSM) and Phytoseiid and Stigmaeid predators. Five leaves were examined under a microscope and the remaining 45 were brushed using a Henderson-McBurnie mite brushing machine. On Sept. 1, amount of 'bronzing' of the foliage caused by ERM and TSSM feeding was rated on a scale of 0 to 10 (10 being the most severe) for each plot. Data were analysed using an analysis of variance and Duncan's multiple range test at the 0.05 level of significance.

RESULTS: As presented in the table below.

CONCLUSIONS: The materials tested did not significantly decrease the numbers of STLM below the untreated control. The STLM population was low through the season. Samples examined on June 1 and Aug. 26 for ERM and TSSM showed no buildup of mites in the treated compared to untreated plots. Very little foliar bronzing of the tree canopies was observed Sept. 1.

OBSERVATIONS: In the May 5 sample 15 eggs were found on 30 fruit spur leaf clusters. Eighteen eggs were found on the 30 spurs picked May 8. None of these eggs had hatched.

NAME AND AGENCY:
MARSHALL, D.B. and PREE, D.J.
Agriculture Canada, Research Station
VINELAND STATION, Ontario L0R 2E0

Treatment (May 8)	Rate g a.i./ha.	June 1 STLM/ cluster	June 1 Parasites[1]/ cluster	June 29 STLM/ cluster	June 29 Parasites/ cluster	Aug 13 STLM/ cluster	Aug 13 Parasites/ clusters	Oct. 5 STLM/ leaf	Oct. 5 Parasites/ leaf
HOE 00522 150F	80.0	0.30a[2]	0.03a	0.11a	0.20a	0.58a	1.27a	2.08a	0.18 b
DIMILIN 25WP	252.8	0.48a	0.00a	0.24ab	0.14a	0.51a	1.14a	2.04a	0.25ab
CARZOL 92SP	1012.0	0.88a	0.08a	0.30ab	1.06 b	0.44a	1.27a	2.24a	0.33ab
BASF 166 801 100SC	505.5	1.03a	0.05a	0.34 b	0.99 b	0.39a	1.24a	2.41a	0.48a
CONTROL	-	0.95a	0.05a	0.30ab	0.68 b	0.47a	0.86a	3.35a	0.39ab

Treatment	Rate g a.i./ha.	June 1 ERM/cluster eggs	June 1 ERM/cluster actives	June 1 Phytos/ cluster	Aug. 26 ERM/leaf eggs	Aug. 26 ERM/leaf actives	Aug. 26 Phytos/ leaf	Aug. 26 Zetzellia/ leaf	Sept.1 Bronzing Rating
HOE 00522 150F	80.0	129.55a	4.45a	0.40a	1.20a	1.43a	0.15ab	0.23ab	2.50a
DIMILIN 25WP	252.8	61.65a	1.50a	0.70a	0.78a	0.36a	0.34ab	0.36a	2.25a
CARZOL 92SP	1012.0	64.9 a	1.50a	0.15a	0.54a	0.40a	0.07 b	0.24ab	3.00a
BASF 166 801 100SC	505.5	18.23a	3.58a	0.65a	0.37a	0.47a	0.36a	0.12 b	1.75a
CONTROL	-	30.55a	1.30a	1.00a	1.15a	0.83a	0.18ab	0.07 b	1.50a

[1] includes Pholotesor ornigis and Chalcids
[2] means followed by the same letter not significantly different ($P < 0.05$, Duncan's multiple range test).

CROP: Apple cv. McIntosh

PEST: Spotted tentiform leafminer (STLM), Phyllonorycter blancardella (Fabr.)

TITLE: CONTROL OF SECOND AND THIRD GENERATION SPOTTED TENTIFORM LEAFMINER.

MATERIALS: DIMILIN 25 W (diflubenzuron), HOE 000522 150F (teflubenzuron).

METHODS: STLM control was evaluated using a randomized complete block design in an orchard of 16-year-old McIntosh apple trees spaced at 6.1 x 6.1 m. Each plot was replicated three times. Plots averaged 0.1 ha in size. The treatments were applied on July 2 when a large number of second generation adults were flying and egg hatch had just begun. The materials were applied with an FMC LV320 airblast orchard sprayer operating at 2700 kPa.

A prespray sample, taken July 2, consisted of 100 leaves taken over the experimental area from halfway along the terminal shoots. Only eggs and sap feeding larvae were present. On July 27 and August 24, four trees per plot were sampled with each sample consisting of 10 leaves per tree taken from halfway along the terminal shoots. Mines were opened and examined under a binocular microscope and all life stages were recorded.

NAME AND AGENCY:
WARNER, J. and COOK, J.M.
Agriculture Canada, Smithfield Experimental Farm, P.O. Box 340, Trenton, Ontario K8V 5R5

RESULTS: Results are summarized in the table below.

CONCLUSIONS: A single application of DIMILIN or HOE 000522, timed for second generation STLM control, reduced the number of living stages and total number of mines per leaf as compared to the unsprayed control.

(Financial support from Hoechst in support of this work is appreciated).

Treatment and formulation	Rate product per ha	NUMBER PER LEAF											
		JULY 2 (Prespray)		JULY 27					AUGUST 24				
		Eggs	Sap-feeders	Living larvae[1]	Parasitized	Empty mines	Dead larvae	Total mines	Living larvae[1]	Parasitized	Empty mines	Dead larvae	Total Mines
Control	-	1.3	0.4	3.9 a[2]	0.2a	1.0a	3.0a	8.2a	1.3 a	0.6a	0.6 a	4.3a	6.8a
DIMILIN 25W	1350 g	1.3	0.4	0.05b	0.0b	0.0b	1.6a	1.6b	0.03b	0.0b	0.0 b	2.2b	2.3b
HOE 000522 150F	400 ml	1.3	0.4	0.02b	0.0b	0.0b	2.0a	2.0b	0.1 b	0.0b	0.01b	2.0b	2.1b

[1] No pupae or emerged STLM were seen.
[2] Means followed by the same letter within each column not signficantly different using Duncan's multiple range test (P=0.05).

CROP: Apple cv. Delicious

PESTS: Spotted tentiform leafminer (STLM), Phyllonorycter blancardella (Fabr.), codling moth (CM), Cydia pomonella (L.)

TITLE: CONTROL OF FIRST AND SECOND GENERATION TENTIFORM LEAFMINER, AND CODLING MOTH.

MATERIALS: DECIS 2.5 EC (deltamethrin), DIMILIN 25W (diflubenzuron), HOE 000522 150F (teflubenzuron), LAB 166 801 100SC.

METHOD: Four-tree plots of 16-year-old Delicious apple trees on MM106 rootstock were replicated four times in a randomized complete block design. Unsprayed guard trees were left between plots to reduce drift. Materials were sprayed until runoff with a hydraulic handgun attached to a Rittenhouse sprayer operating at 2700 kPa.

First generation leafminer control sprays, applied on May 4 at the pink stage of bud development, were timed to coincide with leafminer egg laying. Prespray populations were estimated on May 4 by checking all leaves on each of five clusters per plot selected from the lower centre part of the tree. Post spray samples on May 20 and June 22 consisted of 20 clusters per plot. Samples on July 29 and August 25 consisted of 10 leaves per plot. Leaves were selected from halfway along the terminal shoots. Samples were examined using a binocular microscope. All mines were opened and the various life stages present were recorded.

DECIS, DIMILIN or HOE 000522 were reapplied (same rates as for first generation control) to two of the four trees previously treated with these materials, respectively, to assess 2nd generation control (split plot design). Sprays were applied on June 29 when 2nd generation adults were flying and egg laying was started.

Codling moth injury was assessed by examining all fruit up to a maximum of 100 per tree between Sept. 22 and 29.

RESULTS: Results are summarized below.

CONCLUSIONS: The synthetic pyrethroid DECIS provided the best control of first generation leafminer. DIMILIN and HOE 000522 were slower acting but did reduce the number of first generation mines as compared to the control plots. LAB 166 801 did not reduce leafminer numbers as compared to the unsprayed control plots. When only a single spray was applied for first generation control, none of the materials provided second or third generation leafminer control as compared to the unsprayed plots. A second application of DECIS, DIMILIN or HOE 000522 provided additional control of second and third generation STLM as compared to plots receiving only a single early season application or as compared to the unsprayed plots. The second application of DECIS, DIMILIN or HOE 000522 reduced codling moth injury to the fruit but this reduction was only signficiant at the 5% level with DECIS.

(Financial support from Hoechst in support of this work is appreciated.)

NAME AND AGENCY:
WARNER, J. and COOK, J.M.
Agriculture Canada, Smithfield Experimental Farm, P.O. Box 340, Trenton, Ontario K8V 5R5

Treatment	Formulation	Rate a.i./100 L	1st GENERATION STLM/CLUSTER: May 4 (pre-spray) Eggs	May 20 Eggs + living larvae	June 22 Living STLM	June 22 Total Mines	2nd and 3rd GENERATION STLM/LEAF: July 29 Living STLM	July 29 Total Mines	Aug. 25 Living STLM	Aug. 25 Total Mines	Sep. 22 % Fruit Injured by CM
DECIS[1]	2.5 EC	0.4 g	5.2 a[2]	0.8 c	0.7 b	1.1 c	2.8 b	5.4 a	2.7 a	6.6 a	5.0 a
DIMILIN[1]	25 WP	10.0 g	5.2 a	3.4 b	0.2 b	3.0 bc	2.5 b	4.2 ab	3.1 a	6.7 a	4.9 a
HOE 000522[1]	150 F	1.8 g	7.1 a	3.3 b	0.3 b	3.3 b	2.1 b	3.3 b	2.0 a	4.6 b	3.7 a
LAB 166 801[1]	100 SC	10.0 g	4.7 a	4.1 b	1.9 a	5.3 a	3.6 a	5.2 a	2.8 a	6.0 a	5.8 a
Control	-	-	7.7 a	6.2 a	2.1 a	6.0 a	2.7 b	3.7 b	2.5 a	5.7 ab	9.5 a

[1] Applied May 4, 1987 (Pink).
[2] Means followed by the same letter in each column not significantly different using Duncan's multiple range test (P=0.05).

Treatment and timing		2nd and 3rd GENERATION STLM/LEAF: July 29 Living STLM	July 29 Total Mines	Aug. 25 Living STLM	Aug. 25 Total Mines	Sept. 22 % Fruit Injured by CM
DECIS	1 application[1]	2.8 a[3]	5.4 a	2.7 a	6.6 a	5.0 a
	2 applications[2]	0.3 b	0.7 b	0.5 b	1.2 b	0.7 b
DIMILIN	1 application[1]	2.5 a	4.2 a	3.1 a	6.7 a	4.9 a
	2 applications[2]	0.03 b	0.4 b	0.7 b	1.8 b	0.1 a
HOE 000522	1 application[1]	2.1 a	3.3 a	2.0 a	4.6 a	3.7 a
	2 applications[2]	0.2 b	0.6 b	0.2 b	1.0 b	2.3 a

[1] Applied May 4, 1987. [2] Applied May 4 and June 29, 1987.
[3] Means followed by the same letter in each column for each treatment not significantly different using "P" test (P=0.05).

CROP: Apple var. McIntosh

PESTS: Winter Moth (WM), Operophtera brumata L, pale apple leafroller (PALR), Pseudexentera mali Freeman.

TITLE: 1984 EVALUATION OF BELMARK/DIPEL MIXTURES TO CONTROL WINTER MOTH AND PALE APPLE LEAFROLLER.

MATERIALS: BELMARK 300 EC (fenvalerate), DIPEL WP (Bacillus thuringiensis var. kurstaki Berliner), CAPTAN 50 WP.

METHODS: Treatments were applied at pink (17 May 1984) to two tree plots with a hand-held gun at a pressure of 2800 kPa to runoff. Each treatment included 200 g/100 L of CAPTAN 50 WP because the formulation had a spreader sticker that was needed to ensure good coverage of the foliage by DIPEL. Samples of 4 injured clusters from each tree (2 trees per treatment) were taken 1, 5, 7, 11 and 14 days after treatment. Clusters were dissected and the number of live and dead WM and PALR larvae was recorded. Samples of 100 apples per tree (2 trees per treatment) were removed 7 September and examined in the laboratory for WM and PALR injury.

NAME AND AGENCY:
HARDMAN, John Michael
Agriculture Canada Research Station
Kentvile, N. S. B4N 1J5

RESULTS: The number of live PALR larvae did not vary significantly with treatment. The overall mean (averaged over all post treatment sampling dates) was 1.3 larvae per 4 injured clusters. Other results are summarized in the tables below.

CONCLUSIONS: Fewer WM larvae were present in the BELMARK plot than in the check and DIPEL plots. Intermediate counts were found in the plots with DIPEL/BELMARK mixtures. There were significantly fewer apples with WM injury in the DIPEL/BELMARK mixtures than in the check plot. The low BELMARK (0.7 mL) plot and the low BELMARK mixtures (0.7 mL with either 16 or 33 g DIPEL) had fewer fruit with PALR injury than did the check. These data suggest that mixtures of DIPEL plus the lower rate of BELMARK were more effective than DIPEL alone in preventing WM and PALR injury to apples.

Treatment[1]	Rate /100 L	No. of live WM larvae	WM	Percentage of fruit injured by PALR
BELMARK 300 EC	0.7 mL	0.8 c	3.95 abc	0.28 bc
BELMARK 300 EC	0.7 mL	1.8 bc	0.85 c	0.00 c
+ DIPEL WP	16.0 g			
BELMARK 300 EC	3.3 mL	1.3 bc	1.50 bc	1.03 abc
+ DIPEL WP	16.0 g			
BELMARK 300 EC	0.7 mL	1.5 bc	0.47 c	0.00 c
+ DIPEL WP	33.0 g			
DIPEL WP	33.0 g	3.4 ab	7.33 ab	4.53 a
Check		4.4 a	10.87 a	2.72 ab

1. Each treatment and the check plot included 200 g/100 L of CAPTAN 50 WP because of the spreader sticker included in the formulation.

Means in the same column followed by the same letter are not significantly different (P>0.05) according to Tukeys Studentized range test after square root transformation of the data.

CROP: Apple var. Red Delicious

PESTS: Winter moth Operophtera brumata L., apple brown bug (ABB), Atractotomus mali (Meyer), mullein bug (MB), Campylomma verbasci (Meyer), obliquebanded leafroller (OBLR), Choristoneura rosaceana (Harris).

TITLE: 1986 EVALUATION OF PREBLOOM DIPEL/INSECTICIDE MIXTURES TO CONTROL WINTER MOTH.

MATERIALS: GUTHION 50 WP (azinphos-methyl), CYMBUSH 12.5 WP (cypermethrin), DECIS 2.5 EC (deltamethrin), POUNCE 384 EC (permethrin), DIPEL WP (Bacillus thuringiensis var. kurstaki Berliner), CAPTAN 50 WP, RIPCORD 400 EC (cypermethrin).

METHODS: Treatments were applied at late tight cluster-early pink (20 May 1986) to two tree plots with a hand-held gun at a pressure of 2800 kPa to runoff. The orchard had 3 blocks of Red Delicious trees along a diagonal. Each block included 2 sets of 8 adjacent trees. Each set included 3 plots treated with a specific insecticide (either alone or in a mixture with DIPEL- see table below) and a DIPEL (33 g/100 L) plot. In the central block there was a set of 4 trees- 2 forming the check plot and 2 an adjacent DIPEL plot. Each treatment and the check included 200 g CAPTAN 50 WP/100 L because the formulation included a spreader sticker that was necessary to ensure thorough coverage of the foliage with DIPEL. CAPTAN was also applied as needed through the season to each plot to prevent apple scab. Six days after treatment 8 injured clusters were removed from each tree (2 trees per treatment) and Lepidoptera larvae were identified to species. In the third week of October, 100 apples from each tree (2 trees per treatment) were examined for insect injury.

NAME AND AGENCY:
HARDMAN, John Michael
Agriculture Canada Research Station
Kentville, N.S. B4N 1J5

RESULTS: The results are summarized in the tables below.

CONCLUSIONS: Each of the plots with GUTHION, CYMBUSH, POUNCE, and RIPCORD, 2 of the DECIS plots, and 4 of the 6 DIPEL plots had lower WM injury than the check plot. All of the treated plots, except for one of the DIPEL plots, had WM injury at or below the economically tolerable level of 1% fruit injury. Treatments at early pink are earlier than optimal for protection against OBLR and fruit-stinging mirids and must depend on prolonged residual activity to prevent injury. Each of the plots with CYMBUSH, 2 with DECIS, 2 with POUNCE, 1 with RIPCORD, and 4 of the DIPEL plots had less than 1% OBLR injury. Plots with the higher rates of GUTHION and DECIS, 2 of the DIPEL plots, and all of the CYMBUSH, POUNCE, and RIPCORD plots had a lower percentage of fruit with ABB and MB stings than was found in the check plot. Lowest injury levels (<10%) were found in the plots with higher rates of CYMBUSH, POUNCE, and RIPCORD.

Insecticide[1]	Rate /100 L	Rate of DIPEL g/100 L	Percentage of fruit[2] injured by WM	OBLR	ABB and MB
GUTHION 50 WP	5.9 g	0.0	0.00 c	2.63 ab	80.3 abc
GUTHION 50 WP	5.9 g	16.0	0.25 bc	1.01 ab	77.5 abc
GUTHION 50 WP	29.6 g	16.0	0.25 bc	2.26 ab	54.0 cdef
DIPEL alone		33.0	0.30 bc	0.00 b	86.0 a
CYMBUSH 12.5 WP	1.7 g	0.0	0.00 c	0.00 b	32.2 fg
CYMBUSH 12.5 WP	1.7 g	16.0	0.00 c	0.00 b	45.5 defg
CYMBUSH 12.5 WP	8.3 g	16.0	0.25 bc	0.00 b	3.3 ij
DIPEL alone		33.0	0.00 c	2.00 ab	29.0 fgh
DECIS 2.5 EC	0.9 mL	0.0	0.25 bc	0.25 ab	71.2 abcd
DECIS 2.5 EC	0.9 mL	16.0	0.00 c	2.26 ab	77.0 abc
DECIS 2.5 EC	4.5 mL	16.0	1.00 abc	0.00 b	29.3 fgh
DIPEL alone		33.0	0.00 c	0.30 ab	87.9 a
POUNCE 384 EC	0.8 mL	0.0	0.00 c	1.46 ab	35.8 efg
POUNCE 384 EC	0.8 mL	16.0	0.50 bc	0.25 ab	25.9 gh
POUNCE 384 EC	3.9 mL	16.0	0.00 c	0.00 b	0.0 j
DIPEL alone		33.0	0.25 bc	0.50 ab	30.5 fgh
RIPCORD 400 EC	0.4 mL	0.0	0.00 c	1.87 ab	60.6 bcde
RIPCORD 400 EC	0.4 mL	16.0	0.00 c	1.87 ab	47.0 defg
RIPCORD 400 Ec	1.9 mL	16.0	0.00 c	0.76 ab	9.5 hi
DIPEL alone		33.0	1.87 ab	2.92 a	66.0 abcd
DIPEL near check plot		33.0	0.76 abc	0.25 ab	79.6 abc
Check		0.00	4.00 a	3.48 a	82.5 ab

[1]Each treatment, including the check, had 200g CAPTAN 50 WP/100 L because of the spreader/sticker included in the formulation.

[2]Means in the same column followed by the same letter are not significantly different (P>0.05) according to Tukey's Studentized range test after arc sine transformation of the data

CROP: Apple var. Red Delicious

PESTS: Winter moth Operophtera brumata L., European red mite (ERM), Panonychus ulmi Koch, Typhlodromus pyri Scheuten (TP).

TITLE: 1986 IMPACT OF PREBLOOM DIPEL/INSECTICIDE MIXTURES ON MITE DENSITIES

MATERIALS: GUTHION 50 WP (azinphos-methyl), CYMBUSH 12.5 WP (cypermethrin), DECIS 2.5 EC (deltamethrin), POUNCE 384 EC (permethrin), DIPEL WP (Bacillus thuringiensis var. kurstaki Berliner), CAPTAN 50 WP, RIPCORD 400 EC (cypermethrin).

METHODS: Treatments were applied to control WM at late tight cluster- early pink (20 May 1986) to two tree plots with a hand-held gun at a pressure of 2800 kPa to runoff. The orchard had 3 blocks of trees along a diagonal. Each block included 2 sets of 8 adjacent trees. Each set included 3 plots treated with a specific insecticide (either alone or in a mixture with DIPEL- see table below) and a DIPEL (33 g/100 L) plot. In the central block there was a set of 4 trees- 2 forming the check plot and 2 an adjacent DIPEL plot. Each treatment and the check included 200 g CAPTAN 50 WP/100 L because the formulation included a spreader sticker that was necessary to ensure thorough coverage of the foliage with DIPEL. CAPTAN was also applied as needed through the season to each plot to prevent apple scab. Samples of 4 clusters per tree (2 trees per treatment) were taken 3, 16, and 25 June, 7 and 21 July, 5 and 18 August and 2 September. Leaves were brushed and counted and mite densities were estimated as the number per 100 leaves.

NAME AND AGENCY: HARDMAN, John Michael
Agriculture Canada Research Station
Kentville, N.S. B4N 1J5

RESULTS: The results are summarized in the tables below.

CONCLUSIONS: The experimental plot had no recent exposure to insecticides before the 1986 applications, so initial densities of ERM were low. Cool, wet conditions lasting most of the summer also inhibited population growth, so densities of ERM in all plots were relatively low. Only one plot, that with the higher rate of POUNCE, had a significantly higher density of motile ERM than the check plot. Predatory mites, Typhlodromus pyri, were found in each of the CYMBUSH plots, one of the DECIS plots, one of the DIPEL plots, and in the check plot.

Insecticide[1]	Rate /100 L	Rate of DIPEL WP g/100 L	Number of Motile[2] mites per 100 leaves ERM	TP
GUTHION 50 WP	5.9 g	0.0	14.6 abc	0.0 b
GUTHION 50 WP	5.9 g	16.0	8.1 bc	0.0 b
GUTHION 50 WP	29.6 g	16.0	10.5 bc	0.0 b
DIPEL alone		33.0	0.8 c	0.0 b
CYMBUSH 12.5 WP	1.7 g	0.0	11.3 abc	1.2 ab
CYMBUSH 12.5 WP	1.7 g	16.0	2.8 c	2.3 a
CYMBUSH 12.5 WP	8.3 g	16.0	13.1 abc	0.7 ab
DIPEL alone		33.0	4.3 bc	0.0 b
DECIS 2.5 EC	0.9 mL	0.0	3.0 c	0.0 b
DECIS 2.5 EC	0.9 mL	16.0	26.6 ab	0.8 ab
DECIS 2.5 EC	4.5 mL	16.0	14.4 abc	0.0 b
DIPEL alone		33.0	8.3 bc	0.0 b
POUNCE 384 EC	0.8 mL	0.0	0.0 c	0.0 b
POUNCE 384 EC	0.8 mL	16.0	2.1 c	0.0 b
POUNCE 384 EC	3.9 mL	16.0	41.5 a	0.0 b
DIPEL alone		33.0	0.8 c	0.0 b
RIPCORD 400 EC	0.4 mL	0.0	0.7 c	0.0 b
RIPCORD 400 EC	0.4 mL	16.0	0.8 c	0.0 b
RIPCORD 400 EC	1.9 mL	16.0	0.0 c	0.0 b
DIPEL alone		33.0	5.7 bc	0.9 ab
DIPEL near check plot		33.0	0.9 c	0.0 b
Check		0.0	2.1 c	0.8 ab

1. Each treatment, including the check, had 200g CAPTAN 50 WP/100 L because of the spreader/sticker included in the formulation.
2. Means in the same column followed by the same letter are not significantly different ($P>0.05$) according to Tukey's Studentized range test after square root transformation of the data.

CROP: Apple var. Kings and Wageners

PESTS: Winter moth (WM), Operophtera brumata (L.), pale apple leafroller (PALR), Pseudexentera mali Freeman, eyespotted bud moth (ESBM), Spilonota ocellana Denis & Schiffermuller, apple brown bug (ABB), Atractotomus mali (Meyer), mullein bug (MB), Campylomma verbasci (meyer)European red mite (ERM), Panonychus ulmi Koch,apple rust mite (ARM), Aculus schlechtendali (Nalepa), lemon-yellow mite (LY), Zetzellia mali (Ewing) and Typhlodromus species (TP).

TITLE: EFFECTS OF EARLY PINK APPLICATIONS OF CYMBUSH AND MIXTURES OF DIPEL WITH CYMBUSH AND RIPCORD ON INSECTS AND MITES IN 1987

MATERIAL: CYMBUSH 12.5 WP (cypermethrin), RIPCORD 400 EC (cypermethrin), DIPEL WP (Bacillis thuringiensis var. kurstaki), CAPTAN 50 WP.

METHODS: Treated approximately 1 ha plots by mistblower 12 May. The DIPEL/CYMBUSH and DIPEL/RIPCORD mixtures were applied to equal sized plots of Kings and Wageners that were in the same block. The CYMBUSH treatment and the check trees were in an adjacent block of Kings. The Wageners section of the first block, used only for juice apples, had only occasional applications of insecticide in previous years and had a history of heavy fruit damage from WM.

NAME AND AGENCY:
HARDMAN, John Michael
Agriculture Canada Research Station
Kentville, N.S. B4N 1J5

Samples of 100 fruit per tree were examined 22 September for insect injury. Fruit from 5 Kings trees were examined from the CYMBUSH plot and each of the DIPEL mixtures. Fruit were also examined from 2 check trees (var. Kings). In addition, for each DIPEL mixture, fruit from 10 Wageners were examined. Samples of 4 clusters per Kings tree (2 check and 2-4 treated trees) were taken 13 July, 14 August, and 30 August. Leaves were brushed and counted and mite densities were estimated on a per leaf basis.

RESULTS: The results are summarized in the tables below.

CONCLUSIONS: Lack of insecticide treatments in the past contributed to economic (1%) injury from WM and PALR in the Wagener plots. In the Kings plots there was almost no injury from Lepidoptera and injury from mirids was also less severe than in the Wageners plots. Counts of ERM in mid July were lower in the CYMBUSH plot but the mid and late August counts were higher than in the other plots. LY predators were found in all treated plots. Typhlodromid predators were found in the check plot and the plot with the DIPEL/CYMBUSH mixture. Counts of ARM did not vary significantly among the plots.

Treatment[2]	Rate /ha	Apple variety	Percentage of fruit injured by[1] PALR	WM	ESBM	ABB + MB
CYMBUSH	560.0	Kings	0.0 b	0.0 c	0.0 b	1.7 c
CYMBUSH + DIPEL	56.0 g 556.0 g	Kings	0.0 b	0.0 c	0.4 a	2.4 bc
RIPCORD + DIPEL	12.5 mL 556.0 g	Kings	0.0 b	0.0 c	0.0 b	2.9 bc
CYMBUSH + DIPEL	56.0 g 556.0 g	Wagener	0.7 a	2.8 a	0.0 b	7.5 a
RIPCORD + DIPEL	12.5 mL 556.0 g	Wagener	1.1 a	1.6 ab	0.0 b	5.2 ab
Check		Kings	0.0 b	0.0 b	0.0 ab	2.5 bc

Date	Treatment[2]	Rate /ha	No. of mites + eggs per leaf[1] ERM	ARM	TP	LY
13 July	CYMBUSH	560.0 g	0.7 b	469.4 a	0.0 a	0.0 a
	CYMBUSH + DIPEL	56.0 g 560.0 g	2.6 ab	462.7 a	0.0 a	0.0 a
	RIPCORD + DIPEL	12.5 mL 556.0 g	6.1 a	514.2 a	0.0 a	0.0 a
	Check		3.7 ab	202.8 a	0.0 a	0.0 a
14 August	CYMBUSH	560.0 g	52.5 a	68.6 a	0.0 a	0.3 a
	CYMBUSH + DIPEL	56.0 g 556.0 g	3.4 b	45.1 a	0.0 a	0.0 a
	RIPCORD + DIPEL	12.5 mL 556.0 g	3.8 b	59.5 a	0.0 a	0.0 a
	Check		4.5 b	26.9 a	0.2 a	0.0 a
31 August	CYMBUSH	560.0 g	22.3 a	8.9 a	0.0 a	0.3 a
	CYMBUSH + DIPEL	56.0 g 556.0 g	4.8 b	19.1 a	0.1 a	0.2 a
	RIPCORD + DIPEL	12.5 mL 556.0 g	8.4 ab	22.5 a	0.0 a	0.3 a
	Check		6.2 ab	5.0 a	0.3 a	0.0 a

1. Means with columns followed by the same letter are not significantly different (P>0.05) as determined by Tukey's Studentized range test after arc sine (fruit injury data) or square root (mite counts) transformation of the data.
2. Each treatment included 6.75 kg CAPTAN 50 WP/ha because of the spreader/ sticker included in the formulation.

CULTURE: Pommier

RAVAGEUR: Campagnol des champs, Microtus pennsylvanicus Pennsylvanicul (Ord.)

TITRE: RÉPRESSION DU CAMPAGNOL DES CHAMPS DANS LES VERGERS.

PRODUITS: Rozol (chlorophacinone 0.005%); Ramik brun (diphacinone 0.005%); Volid (brodifacoum 0.001%).

MÉTHODES: En 1987, nous avons effectué des essais de répression estivale, à Sainte-Famille, Ile Orléans. Les traitements avec les appâts empoisonnés, ont été faits le 10 août 1987 dans des parcelles de 100 pommiers standards, en trois répétitions avec parcelles témoin. Les appâts commerciaux se présentaient sous la forme de boulettes à saveur attirante et résistantes aux intempéries. Leur application a été faite à la main, à la dose de 11 kg/ha, à raison de quatre (4) stations pour chacun des arbres, soit environ 25 g. par arbre. Un trappage intensif a été effectué pendant 4 jours dans chacune des parcelles, une semaine avant et trois semaines après le traitement afin de nous permettre d'évaluer la variation de la population de rongeurs et établir l'efficacité des produits employés. A chacun des trappages, des pièges ont été disposés à tous les 4 mètres, sur une ligne parallèle aux rangées de pommiers représentant 25% de la surface totale de la parcelle. Les lignes de trappage avant et après le traitement étaient différentes.

NOM ET ORGANISME:
BOUCHARD, C.
Service de recherche en phytotechnie de Québec
Ministère de l'Agriculture, des Pêcheries et de l'Alimentation
2700, rue Einstein
Sainte-Foy, Québec G1P 3W8

RÉSULTATS: Les résultats sont indiqués dans le tableau ci-dessous.

CONCLUSION: Les essais ont été effectués sur une population initiale de campagnols des champs que l'on peut considérer très élevée. Pendant toute la durée de l'expérience, les conditions climatiques sont demeurées excellentes favorisant ainsi l'activité des rongeurs. Compte tenu de ces conditions les produits à l'essai se sont avérés très efficaces.

NOMBRE DE CAPTURES

RODENTICIDE	AVANT	APRES	% REDUCTION	% REDUCTION **
brodifacoum	23	4	82.60% a *	90.47%
diphacinone	23	7	75.86% a	83.33%
chlorophacinone	21	10	52.38% a	76.19%
témoin	24	42	- 75.00% b	0.00%

* Les différences entre les données suivies d'une même lettre ne sont pas significative à 5% (Duncan's Multiple Range Test).

** Ajusté selon la formule d'Abbott.

CROP: Peach cv. Loring

PEST: Oak Bug, *Lygocoris omnivagus* (Knight)

TITLE: CONTROL OF OAK BUG WITH APPLICATIONS OF CYMBUSH

MATERIALS: CYMBUSH 250 g a.i./L EC (cypermethrin)

METHODS: A six year old block of peaches cv. Loring with tree spacing 3 m by 6 m was used. Two adjacent rows under large overhanging oaks were selected and treatments assigned to single tree plots (replicated five times). One row of five trees was treated with CYMBUSH and the other was as untreated controls. CYMBUSH was diluted to a rate comparable to 3370 L of water per ha. and sprayed until runoff (3-4 L/plot) with a truck-mounted sprayer equipped with a Spraying Systems handgun fitted with a D-6 orifice plate. Pressure was set at 1379 kPa. Plots were sprayed twice, May 29 and again June 4. Samples of 30 to 50 fruit were examined on the trees prior to applications on May 29 and June 4, and subsequently on June 11, 25, and July 11.Damage to fruit was expressed as percentage injury and data were transformed using an Arcsin transformation prior to analysis of variance. Means were separated by comparing the calculated to the critical F value at the 0.05 level of significance.

NAME AND AGENCY:
PREE, D.J., MARSHALL, D.B. and COLE, K.J.
Agriculture Canada, Research Station
VINELAND STATION, Ontario L0R 2E0

RESULTS: As presented in the table below.

CONCLUSIONS: In the prespray sample May 29, trees to be sprayed had significantly more oak bug injured peaches. The CYMBUSH application May 29 effectively reduced damage for ca. 7 days, or until the sample June 11. The second application June 11 resulted in significantly lower damage throughout the rest of the sample period. Most of the damage occurred between May 27 and June 4. Two applications of CYMBUSH, while significantly reducing oak bug injury, did not prevent high levels of damage to peaches on sprayed trees.

Sample Date	Percent Injured Peaches Sprayed	Unsprayed
May 29 (prespray)[1]	10.0 a[2]	2.4 b
June 4	39.2 a	64.0 b
June 11	35.2 a	64.3 a
June 25	30.8 a	73.2 b
July 11	40.1 a	79.6 b

[1] sprayed May 29, June 11.
[2] mean of 5 replications, values followed by same letter are not significantly different, F test.

CROP: Peach

PEST: Peachtree borer, Synanthedon exitiosa (Say)

TITLE: ORCHARD EVALUATION OF THE COMMERCIALLY REARED NEMATODE, HETERORHABDITES HELIOTHIDES FOR THE CONTROL OF PEACHTREE BORER (PTB) LARVAE.

MATERIALS: Heterorhabdites heliothides.

METHODS: Weeds and soil were pulled away from the base of 0.12 ha of Early Redhaven and Redhaven peach trees. The frass from the outside of the PTB tunnels was scraped away and the number of active tunnels per tree assessed. Nematodes were applied June 16 to trees in the following treatments: a spray of 200 nematodes/ml around the base of the tree using a backpack sprayer; injections of 2 ml of 1000 nematodes with a syringe into each active PTB tunnel; and applications of 2 ml of 1000 nematodes to the outside of each fresh PTB tunnel. Each treatment was applied to 10 trees in a completely randomized design which included 10 control trees. The trunks were irrigated before the treatments were applied, the air humidity on the day of treatment was 58% and the temperature 28°C. Screen trunk cases were tied around the base of each of the 40 trees.

Four times from June until the end of September, the trunk cages were lifted and the number of emerged PTB adults counted.

NAME AND AGENCY:
COSSENTINE, J.E., BANHAM, F.L. and JENSEN, L.B.M.
Agriculture Canada
Research Station
Summerland, British Columbia V0H 1Z0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: From analysis of the data it appears that the nematode spray at the base of the peach trees significantly ($P < .05$) lowered % PTB survival. However, PTB survival and emergence within the control trees was only 20.14% by the end of the summer test period. The nematode shows promise as a PTB control treatment and should be more closely studied.

Treatment	% PTB adults eclosing from active tunnels[1]
Control	20.14 a[2]
Syringed inside tunnel	7.19 ab
Syringed outside tunnel	7.14 ab
Sprayed at base of tree	3.97 b

[1] percentages were transformed before analysis using an arcsin tranformation.

[2] means followed by the same letter are not significantly ($P = .05$) different as determined by Duncan's Multiple Range Test.

CROP: Peach var. Vee Glo

PEST: Tarnished plant bug, *Lygus lineolaris* (P. de B.)

TITLE: EVALUATION OF INSECTICIDES FOR CONTROL OF INSECT PESTS OF PEACH, 1987

MATERIALS: KARATE 50 EC (cyhalothrin 50 g ai/L), CYMBUSH 250 EC (cypermethrin 250 g ai/L), APM 50 WP (azinphos-methyl 500 g ai/kg)

METHODS: Treatments were applied to two tree plots with a hand-held gun at a pressure of 2,100 kPa and sprayed to run-off (approximately 3,000 litres per hectare). Plots were replicated 4 times in a completely randomized design. First treatment was applied according to recommendation on June 15. Thereafter, 6 treatments were applied on June 23 and 29, July 6, 16 and 27 and August 7. Peaches were randomly thinned during July 16-25. Trees were inspected periodically for tarnished plant bug damage.
Location: Niagara-on-the-Lake, Ontario

NAME AND AGENCY:

WOERLEN, T.
Chipman, A Business Unit of C-I-L Inc.
400 Jones Road
Stoney Creek, Ontario
L8G 3Z1

RESULTS: The results are summarized in the table below.

CONCLUSIONS: At the June 25 assessment date, KARATE 50 EC at 0.0125 kg ai/ha and APM 50 WP significantly reduced the number of fruit damaged by tarnished plant bug compared to the other treatments and the untreated check.

TREATMENT	RATE (kg ai/ha)	TARNISHED PLANT BUG DAMAGE[1]	
		June 25	August 25
KARATE 50 EC	0.0100	8.2 b[2]	3.6 a
KARATE 50 EC	0.0125	0.8 a	1.7 a
CYMBUSH 250 EC	0.1000	3.7 ab	2.2 a
APM 50 WP	1.0000	2.4 a	3.8 a
Check	-	8.3 b	4.2 a

1. Average number of damaged fruit per 100 inspected per plot.
2. Treatment means in the same column followed by the same letter are not significantly different at the 5% level (t-test, data has been square root transformed, C = 0.5).

CROP: Pears var. Anjou

PEST: European Red Mite, Panonychus ulmi (Koch)

TITLE: Evaluation of DPX-Y5893 treatment for control of mite pests of Pears, 1987.

MATERIALS: SAVEY 50% WP (DPX-Y5893, hexythiazox)

METHODS: Treatments were applied to single tree plots with a hand-gun at a pressure of 2587.5 kPa. Plots were replicated four times in a completely randomized design. DPX-Y5893 was applied at 50, 100 and 150 g ai/ha at a threshold level of approximately 0.5 motile mites/leaf (July 18, 1987). The trees were inspected for the presence of Panonychus ulmi, and Tetranychus mcdanieli. Mites were removed from a 25 leaf sample per plot using a brushing machine and counted under a binocular mircrosope. Location: Kelowna, B.C.

NAME AND AGENCY:
DUMAINE L.C., J.G. HATFIELD
Du Pont Canada Agricultural Products
Box 2300, Streetsville, Mississauga
Ontario L5M 2J4

RESULTS: The results are summarized in the table below.

CONCLUSIONS: On the final evaluation date, (31 days after treatment), all rates of SAVEY tested, significantly lowered the motile populations of Panonychus ulmi when compared to the check. There were no motile forms present in the 150 g ai/ha treatment of SAVEY on the final evaluation date.

TREATMENT	RATE g ai/ha	DATE APPLIED	EUROPEAN RED MITES					
			MOTILE			EGGS		
			1*	2	3	1	2	3
SAVEY	50	18-07-87	10.3 a**	1.3 a	0.5 a	15.8 a	25.3 a	12.5 a
SAVEY	100	18-07-87	17.8 a	3.3 a	0.3 a	36.8 a	62.0 b	51.8 a
SAVEY	150	18-07-87	10.5 a	2.0 a	0.0 a	19.8 a	42.8 ab	16.0 a
Check			12.8 a	20.3 b	12.5 b	21.5 b	17.3 a	63.3 a
LSD			(13.2)	(6.4)	(4.1)	(24.8)	(31.6)	(54.5)

* Evaluation dates:
1. 07-07-87 (pre-spray)
2. 30-07-87 (12 days after treatment)
3. 18-08-87 (31 days after treatment)

** Treatment means in the same column followed by the same letter are not significantly different at the 5% level (LSD.05)

CROP: Pear cv. Bartlett

PEST: Pear psylla, Psylla pyricola (Foerster).

TITLE: EVALUATION OF INSECTICIDES FOR CONTROL OF PEAR PSYLLA.

MATERIALS: BELMARK 300 g a.i./L EC (fenvalerate), GUTHION 360 g a.i./L F (azinphos-methyl), BRIGADE 10 WP (bifenthrin), CARZOL 92 SP (formetanate hydrochloride), SUN OIL 6E 98.8 wt % oil.

METHODS: Treatments were replicated four times and assigned to single tree plots according to a randomized complete block design in a block of Bartlett trees spaced 3.0 m by 6.0 m. Plots were sprayed until runoff with a truck-mounted sprayer equipped with a Spraying Systems handgun fitted with a D-6 orifice plate. Pressure was set at 1379 kPa. Materials were diluted to a concentration comparable to 3370 L of water/ha. and applied July 16 (2.5-5.5 L/plot). Plots were sampled July 15 (prespray), July 23, and Aug. 6. Six actively growing terminals were taken from each plot and numbers of viable eggs and nymphs were counted on the stems and surfaces of the five distal leaves.

NAME AND AGENCY:
MARSHALL, D.B. and PREE, D.J.
Agriculture Canada, Research Station
VINELAND STATION, Ontario LOR 2E0

Data were analysed using an analysis of variance and Duncan's multiple range test at the 0.05 level of significance.

RESULTS: As presented in the table below.

CONCLUSIONS: Numbers of eggs and nymphs in each treatment were similar in the July 15 prespray sample. By July 23, plots treated with BELMARK had significantly fewer nymphs than the untreated control plots. There was no statistical difference in the number of nymphs/shoot for any of the other treatments. The fewest eggs were also found in BELMARK treated plots. In the Aug. 6 sample the lowest number of nymphs were found in plots treated with BELMARK, GUTHION, SUN OIL with GUTHION, and SUN OIL. CARZOL treated plots had the highest numbers of nymphs.

OBSERVATIONS: No fruit finish problems were observed at harvest in plots treated with SUN OIL or SUN OIL with GUTHION.

Treatment	Rate g a.i./ha	July 15 (prespray) eggs/ shoot	July 15 (prespray) nymphs/ shoot	July 23 (7 day postspray) eggs/ shoot	July 23 (7 day postspray) nymphs/ shoot	Aug. 6 (21 day postspray) eggs/ shoot	Aug. 6 (21 day postspray) nymphs/ shoot
BELMARK 300 EC	135.0	64.0a[1]	21.4a	6.8a	4.1a	26.5abc	2.6a
GUTHION 3F	1050.0	26.1a	17.5a	12.7ab	13.7ab	10.7a	2.2a
SUN OIL 6E plus GUTHION 3F	34.1 L product[2] plus 1050.0	47.5a	33.4a	25.3ab	9.5ab	14.2ab	2.4a
SUN OIL 6E	34.1 L product[2]	24.9a	15.5a	49.7ab	10.2ab	22.5ab	3.4a
BRIGADE 10 WP	35.0	37.8a	22.8a	22.7ab	8.8ab	73.1 c	15.4ab
CARZOL 92 SP	1012.0	56.3a	38.0a	58.7 b	13.5ab	62.0 bc	23.3 b
Control	-	37.6a	18.1a	55.2ab	17.1 b	52.8abc	16.3ab

[1] means followed by the same letter not significantly different ($P < 0.05$, Duncan's multiple range test)
[2] 1% emulsion

CROP: Pear cv. Bartlett

PEST: Pear psylla, Psylla pyricola Foerster

PREDATORS: Anthocoris spp., Deraeocoris brevis, Campylomma verbasci and Chrysopa spp.

TITLE: EVALUATION OF INSECTICIDES FOR CONTROL OF PEAR PSYLLA.

MATERIALS: HOE 000522 15F (teflubenzuron), DIMILIN 25WP (diflubenzuron) and INSEGAR 25WP (fenoxycarb)

METHODS: This experiment was conducted in 1986. The orchard used consisted of mature Bartlett pear trees planted 6 x 4.5 m. Plot size was 4 x 6 trees. Two replicates of 6 treatments were assigned in a randomized plot design. Sprays were applied with an air-blast concentrate type sprayer calibrated to deliver 675 L/ha of spray volume. All plots were treated 25 June and 9 July. A third treatment was applied to the HOE 00522 and DIMILIN plots on 7 August. Pear psylla nymphs were counted on samples of 25 leaves from new shoot growth at the periphery of the tree and 25 leaves from spur growth approximately 1 m from the periphery of the trees. The leaves were picked at random from the 8 central trees of each plot. The peripheral trees of the plots were used as guard rows. Predator numbers were assessed using a 45 x 45 cm beating tray. Fifteen limb-tap samples were taken at random from the 8 central trees in each plot on the same dates as shown in the table below for pear psylla nymph counts. The values shown for pear psylla nymphs and predators are the averages for the two replicates per treatment.

NAME AND AGENCY:
McMULLEN, R.D. and JONG, C.
Agriculture Canada
Research Station
Summerland, British Columbia V0H 1Z0

RESULTS: See table below.

CONCLUSIONS: Two sprays of INSEGAR 25WP at 0.75 and 1.0 kg/ha provided control of pear psylla superior to 2 sprays of INSEGAR 25WP at 0.5 kg/ha or DIMILIN 25WP at 1 kg/ha, which were about equal in effectiveness. HOE 00522 15F at 1.5 L/ha in three treatments was inferior. All rates of INSEGAR and the DIMILIN treatment resulted in moderate suppression of predator numbers, although this may have been due to decreases in availability of prey. the HOE 00522 treatment resulted in the greatest decrease in predator numbers even though prey numbers were relatively high. During July and August Deraeocoris brevis was the most abundant predator, comprising about 75 percent of the predator population. Anthocoris spp. were the next most abundant followed by Campylomma verbasci and Chrysopa spp.

Treatment	Rate per ha	Psylla nymphs per 50 leaves/predators per 15 samples					
		June 17	July 3	July 16	July 30	Aug 13	Aug 27
HOE 00522 15F	1.5 L	19/7	85/3.5	85/5.5	69.5/*	33/18.5	18.5/27
DIMILIN 25WP	1 kg	17/8	60/0.5	24/1.5	18	38.5/48	9.5/41.5
INSEGAR 25WP	0.5 kg	35.5/10	50/8.5	19.5/9	5.5	16.5/44.5	0.5/30.5
INSEGAR 25WP	0.75 kg	35/12.5	52.5/2.5	18.5/11	2.5	12/51.5	2/19
INSEGAR 25WP	1 kg	15/5	34/3.5	14/9	1.5	4/35.5	1/21
Check	no treatment	27/10	76.5/55	127/4.5	132	90.5/88	33.5/63

/* No record of predators.

CROP: Pear cv. Bartlett

PEST: Pear psylla, Psylla pyricola Foerster

PREDATORS: Anthocoris spp., Deraeocoris brevis, Campylomma verbasci and Chrysopa spp.

TITLE: EVALUATION OF INSECTICIDES FOR CONTROL OF PEAR PSYLLA.

MATERIALS: HOE 000522 15F (teflubenzuron), DIMILIN 25WP (diflubenzuron), BRIGADE 10W (bifenthrin), INSEGAR 25WP (fenoxycarb)

METHODS: The experiment was conducted in a mature Bartlett pear orchard planted 6 x 4.5 m. Plot size was 4 x 6 trees. A single plot, randomly allocated, was used for each treatment except that two unsprayed plots were used as checks. For the check plots, the values given in the table below are the average counts for the two plots. Sprays were applied 4 June, 25 June and 16 July with an air-blast concentrate type sprayer calibrated to deliver 625 L/ha of spray volume. Pear psylla nymphs were counted on samples of 25 leaves from new shoot growth at the periphery of the trees and 25 leaves from spur growth approximately 1 m from the periphery of the trees. The leaves were picked at random from the 8 central trees in each plot. The peripheral trees of the plots were used as guard rows. Predator numbers were assessed using a 45 x 45 cm cloth covered beating tray. Fifteen limb-tap samples were taken at random from the 8 central trees in each plot on the same dates as shown in the table below for pear psylla nymph counts.

NAME AND AGENCY:
McMULLEN, R.D. and JONG, C.
Agriculture Canada
Research Station
Summerland, British Columbia V0H 1Z0

RESULTS: See table below.

CONCLUSIONS: As indicated by the numbers in the table below, by 23 June and after all 3 rates of INSEGAR provided excellent suppression of pear psylla. Both HOE 00522 and DIMILIN provided only moderate suppression of pear psylla nymph numbers. BRIGADE was totally ineffective against pear psylla. The increase in numbers of pear psylla nymphs in the BRIGADE plots over those in the checks can be accounted for by the almost total elimination of predators by these treatments. In June, the predominant predator species was Campylomma verbasci. In July and August, Deraeocoris brevis and Anthocoris spp. were present in about equal proportions and comprised about 90 percent of the predator population. Chrysopa spp. comprised about 10 percent of the population. Predator numbers were least affected by the DIMILIN treatments and only moderately affected by the HOE 00522 treatments. Although the numbers of predators in the INSEGAR treatments were lower than in the DIMILIN AND HOE 00522 treatments this may have been more due to the reduced number of prey than the direct effect of INSEGAR.

Treatment	Rate per ha	Psylla nymphs per 50 leaves/predators per 15 samples					
		June 1	June 23	July 6	July 21	Aug 5	Aug 18
HOE 00522 15F	6L	42/76	32/18	17/5	21/4	3/32	4/10
HOE 00522 15F	3L	59/43	72/23	55/3	23/3	4/16	21/10
DIMILIN 25 WP	2 kg	55/57	38/48	22/10	15/18	7/20	12/14
DIMILIN 25 WP	1 kg	45/45	50/29	26/9	24/18	3/35	0/12
BRIGADE 10W	0.5 kg	35/60	91/1	241/0	163/1	51/1	42/3
BRIGADE 10W	0.25 kg	47/64	168/2	271/0	124/3	72/0	97/3
INSEGAR 25WP	1 kg	37/36	6/28	0/9	0/7	0/6	1/5
INSEGAR 25WP	0.75 kg	46/77	1/34	1/8	0/5	1/5	3/4
INSEGAR 25WP	0.5 kg	52/37	2/35	0/14	2/13	1/12	8/5
Check	--	44/53	98/36	32/21	22/18	2/24	6/14

CROP: Lowbush Blueberry.

PEST: Blueberry maggot, Rhagoletis mendax Curran.

TITLE: CONTROL OF BLUEBERRY MAGGOT IN NEW BRUNSWICK

MATERIALS: Pherocon AM traps (Zoecon Corp., Palo Alto, CA); automatic mist blower with micronair head, model MC 50R (Automatic Equipment Mfg. Co., Pender, NE; CYGON 480 EC (dimethoate).

METHODS: Pherocon AM traps were placed in 6 sprout (non-crop) and 6 adjacent crop fields on June 16-18 to monitor adult populations. Each sprout field was divided into 4 equal plots with 1-2 traps/plot placed in areas sheltered from the prevailing winds. Traps in the adjacent crop fields 1-4 per ha, were placed in areas near the sprout fields at sites with a plentiful supply of berries. All traps were inspected 3 times weekly until harvest. Each sprout field (A-F) and crop fields B and C were sprayed once with CYGON, 500 ml/ha, with an automatic mist blower mounted on a tractor PTO. The sprays were applied within 7 days of the first adult capture. No sprays were applied in crop fields A, D, E, and F.

Four, one liter samples of ripe berries were collected from each crop field at harvest and examined for maggots (larvae) to determine the effectiveness of the treatments.

NAME AND AGENCY:
NEILSON, Willis
Agriculture Canada, Research Station Kentville, Nova Scotia B4N 1J5

ESTABROOKS, Evans
Agriculture Canada, Research Station Fredericton, New Brunswick E3B 4Z7

RESULTS: One spray of dimethoate applied to sprout and adjacent crop fields (B and C) provided excellent control of blueberry maggot (Table); no maggots (larvae) were found in the berries at harvest.

One spray of dimethoate applied only in sprout (non-crop) fields provided good (A, E, and F) to excellent (D) control of blueberry maggot in adjacent crop fields (Table); 0.5 to 1.75 and 0 maggots/liter.

CONCLUSIONS: One spray of dimethoate, 500 ml/ha, applied to sprout (non-crop) and adjacent crop fields will provide excellent seasonal control of blueberry maggot.

Adult captures of R. mendax on Pherocon AM traps in sprout (non-crop) and crop fields, spray dates, and maggot infestations at harvest, Charlotte County, New Brunswick.

Fields	Area (ha)	Traps	Capture Period	Adult Captures	Sprays	Spray Dates	Adults/Trap Pre-Spray (days)	Adults/Trap Pre-Spray	Adults/Trap Post Spray	Maggots/L (at harvest)
A Sprouts	2.0	4	Jul 3-14	2	1	July 5	2	.25	.25	
Crop	1.0	4	Jul 3-27	12	None	-	-	3.00	-	1.75±1.50
B Sprouts	1.0	4	Jul 1-27	12	1	July 5	4	2.50	.50	
Crop	3.0	8	Jun 28-July 20	15	1	July 5	7	1.50	.38	0
C Sprouts	4.5	8	Jun 28-July 27	30	1	July 5	7	3.38	.38	
Crop	2.5	6	Jun 28-July 7	16	1	July 5	7	2.33	.33	0
D Sprouts	1.0	4	July 9	2	1	July 13	4	.50	0	
Crop	4.8	10	July 9-29	19	None	-	-	1.90	-	0
E Sprouts	1.5	4		0	1	July 13	-	0	0	
Crop	6.0	12	July 3-14	12	None	-	-	1.0	-	.75±.96
F Sprouts	4.3	8	June 28-30	6	1	July 5	7	.75	0	
Crop	6.0	10	June 28-July 29	17	None	-	-	1.70	-	.50±1.00

CROP: Lowbush Blueberry.

PEST: Blueberry maggot, Rhagoletis mendax Curran

TITLE: AERIAL SPRAYS FOR CONTROL

MATERIALS: Pherocon AM traps (Zoecon Corp.,Palo Alto, CA); Guthion 240 EC; aerial sprays (Maritime Aerial Spraying Service, Waterville, N. S.); glass plates (12 x 20 in).

METHODS: Pherocon AM traps were placed in 2 crop fields on June 22 to monitor adult populations. Each field was divided into 4 equal plots with 1-2 traps/plot placed 5-10 cm above blueberry plants with an abundant crop of berries and sheltered from the prevailing winds. All traps were inspected 3 times weekly until harvest.

Each field was sprayed once from the air on July 14 with Guthion 240 EC, 1.4 L/ha. Glass plates were deployed at various locations in each field prior to spraying to determine the distribution of spray deposits. The plates were removed 45 hours after spraying and washed with methanol to recover the spray deposits. The amount of Guthion/plate was determined by GLC using a nitrogen-phosphorus detector.

Four, one liter samples of ripe berries were collected from each field at harvest and examined for maggots to determine the effectiveness of the treatment.

NAME AND AGENCY:
NEILSON, Willis
GAUL, Sonia
Agriculture Canada, Research Station
Kentville, Nova Scotia B4N 1J5
B4N 1J5

CROZIER, Lorne
Nova Scotia Department of Agriculture and Marketing, Truro, Nova Scotia B2N 5E3

RESULTS: One aerial spray of Guthion 240 EC applied on July 14 did not provide adequate control of the blueberry maggot (Table 1). Maggots/liter of ripe berries in Fields A and B at harvest were 17.8 and 19.8 respectively. In fields A and B, adult captures after spraying were excessive and suggests that spraying had very little impact on the adult populations.

RESIDUES: Spray deposits were highly variable; 4.5±4.3 µg/plate (0.2-26.5) in field A and 22.2±26.3 µg/plate (7.4-75.3) in Field B.

The amount expected per plate was estimated to be 52.05 µg immediately after application and ca. 26.0 µg 48 hours later.

CONCLUSIONS: One aerial spray of Guthior 240 EC did not provide seasonal control of blueberry maggot. The distribution of the spray was very erratic and less than expected. Further study will be necessary to determine rates of application, timing, and the number of sprays to provide seasonal control of adult populations.

Adult captures of R. mendax on Pherocon AM traps in crop fields, spray date, and maggot infestations at harvest, Cumberland County, Nova Scotia

Fields	Area (ha)	Traps	Capture Period	Adult Captures	Spray Date	Pre-Spray (days)	Adults/Trap Pre Spray	Wks after spraying 1	2	3	4	5	Maggots/Liter (at harvest)
A	8.0	8	July 7-Aug 18	432	Jul 14	7	4.38	5.00	12.88	10.88	10.63	10.25	17.8±23.8
B	5.0	6	Jun 25-Aug 18	443	Jul 14	19	24.17	9.50	13.00	10.33	8.17	7.00	19.8±12.7

CROP: Lowbush Blueberry.

PEST: Blueberry maggot, Rhagoletis mendax Curran.

TITLE: CONTROL OF BLUEBERRY MAGGOT IN NOVA SCOTIA

MATERIALS: Pherocon AM traps (Zoecon Corp., Palo Alto, CA); automatic mist blower with micronair head, model MC 50R (Automatic Equipment Mfg. Co., Pender, NE; SYSTEM 480 EC (dimethoate).

METHODS: Pherocon AM traps were placed in 4 sprout (non-crop) and 4 adjacent crop fields on June 22 to monitor adult populations. In crop fields, they were placed within 10 m of the adjacent sprout field in sheltered areas 5-10 cm above blueberry plants with an abundant crop of berries. In sprout fields, they were placed in sheltered areas within 10 m of the adjacent crop fields. All traps were inspected 3 times weekly until harvest, and were replaced with new traps on July 13.

Each sprout and crop field was sprayed once or twice with System 480 EC, 500 ml/ha, with an automatic mist blower mounted on a tractor PTO. The first spray was applied 5-13 days after the first adult capture. A second spray was applied 10 days later. A perimeter spray with coverage up to 30 m was applied to crop fields adjacent to sprout field D.

Four, one liter samples of ripe berries were collected from each crop field at harvest and examined for maggots to determine the effectiveness of the treatments.

NAME AND AGENCY:
NEILSON, Willis
GAUL, Sonia
Agriculture Canada, Research Station
Kentville, Nova Scotia
B4N 1J5

CROZIER, Lorne
Nova Scotia Department of Agriculture and Marketing, Truro, Nova Scotia B2N 5E3

RESULTS: Two sprays of dimethoate applied to sprout and adjacent crop fields provided good (1.5 maggots/L) to excellent (0) control of blueberry maggot (Table: B and C). Two sprays applied in a sprout field and one in the adjacent crop also provided good control (Table, A). Two sprays applied in sprout field D and perimeter sprays in the adjacent crop fields provided good (1.0 maggots/L) to excellent control (0 maggots).

Adult captures/trap were not reduced substantially by the first spray in either sprout or crop fields. In sprout fields A, B, and D and crop field B captures increased after the first application. Captures were reduced substantially by the second application.

CONCLUSIONS Two sprays of dimethoate will be required on crop and adjacent sprout fields to provide effective control of the blueberry maggot when adult captures are excessive. Further study will be required to determine if better control of adult populations can be obtained with a higher rate of application, especially for the first spray.

Adult captures of R. mendax on Pherocon AM traps in sprout (non-crop) and crop fields, spray dates, and maggot infestations at harvest, Cumberland County, Nova Scotia

Fields	Area (ha)	Traps	Capture Period	Adult Captures	Sprays	Spray Dates	Pre-Spray (days)	Adults/Trap Pre-Spray	Adults/Trap Pest Spray	Maggots/L (at harvest)
A Sprouts	2.0	4	Jul 1-22	38	2	Jul 6	5	0.5		
						Jul 16	10	8.5	0.5	
Crop	2.0	4	Jul 3-Aug 14	123	1	Jul 16	13	27.75	3.0	1.0±.82
B Sprouts	4.0	4	Jun 25-Aug 14	217	2	Jul 6	11	17.75		
						Jul 16	10	30.75	5.75	
Crop	4.0	4	Jul 1-Aug 14	266	2	Jul 6	5	27.25		
						Jul 16	10	28.50	10.75	1.5±3.0
C Sprouts	2.0	4	Jun 29-Aug 12	197	2	Jul 6	7	27.50		
						Jul 16	10	16.75	5.0	
Crop	2.5	4	Jun 29-Aug 5	95	2	Jul 6	7	13.0		
						Jul 16	10	8.0	2.75	0
D Sprouts	1.0	4	Jun 29-Aug 10	156	2	Jul 6	7	1.0		
						Jul 16	10	32.25	4.75	
*Crop (W)	5.0+	2	Jul 6-Aug 10	72	1	Jul 16	10	32.0	4.0	1.0±1.41
*Crop (N)	10.0+	2	Jul 8-Aug 10	69	1	Jul 16	8	31.0	3.5	0

*Perimeter spray with coverage to 30 m

CROP: Grape var. Niagara

PEST: Grape berry moth, Endopiza viteana (Clements)

TITLE: EVALUATION OF INSECTICIDES FOR CONTROL OF THE GRAPE BERRY MOTH, 1987

MATERIALS: KARATE 50 EC (PP 321 50 g/L), CYMBUSH 250 EC (cypermethrin 250 g/L), IMIDAN 50 WP (phosmet).

METHODS: Plots consisted of 5 vines each and were replicated 4 times in a completely randomized block design. Treatments were applied June 5, July 8, and August 8 according to provincial recommendations using a hand held gun. Applications were made at a pressure of 2450 kPa to run-off. Damage was assessed periodically in terms of the number of damaged berries per 30 bunches per plot.
Location: St. David's, Ontario

NAME AND AGENCY:

ZANDSTRA, J.W.,
SMITH, D.B.
Chipman, A Business Unit of C-I-L Inc.
400 Jones Road
Stoney Creek, Ontario
L8G 3Z1

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All treatments provided significant control of the grape berry moth early in the season. Significant control was not achieved later in the season with any treatment. It would appear as though timing of treatments later in the season was not adequate.

TREATMENT	RATE (kg ai/ha)	GRAPE BERRY MOTH DAMAGE[1] July 27	Sept 3
KARATE 50 EC	0.0100	0.5 b* (91)[2]	8.2 a (26)
KARATE 50 EC	0.0125	0.3 b (95)	9.6 a (14)
KARATE 50 EC	0.0150	0.8 b (86)	8.7 a (22)
IMIDAN 50 WP	1.6500	0.0 b (100)	3.9 a (65)
CYMBUSH 250 EC	0.0600	0.3 b (95)	12.5 a (-11)
Check	-	5.6 a	11.1 a

1. Average number of berries damaged per 30 bunches per plot.
2. Percent control relative to the check plots.

* Treatment means in the same column followed by the same letter are not significantly different at the 5% level (t-test).

CROP: Grape var. Niagara

PEST: Grape berry moth, Endopiza viteana (Clements)

TITLE: EVALUATION OF INSECTICIDES FOR CONTROL OF THE GRAPE BERRY MOTH, 1987

MATERIALS: KARATE 50 EC (PP 321 50 g/L), CYMBUSH 250 EC (cypermethrin 250 g/L), IMIDAN 50 WP (phosmet).

METHODS: Plots consisted of 5 vines each and were replicated 4 times in a completely randomized block design. Treatments were applied June 5, July 8, and August 8 according to provincial recommendations using a hand held gun. Applications were made at a pressure of 2450 kPa to run-off. Damage was assessed periodically in terms of the number of damaged berries per 30 bunches per plot.
Location: Virgil, Ontario

NAME AND AGENCY:

ZANDSTRA, J.W.,
SMITH, D.B.
Chipman, A Business Unit of C-I-L Inc.
400 Jones Road
Stoney Creek, Ontario
L8G 3Z1

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All treatments except KARATE at 0.01 kg a.i./ha provided significant control of berry moth at the first assessment date. KARATE at 0.0125 and 0.015 kg ai/ha achieved control not significantly different from the standard IMIDAN while CYMBUSH was less effective. No significant control was achieved in September, however, relative control was similar to that achieved earlier in the season. It would appear as though timing of treatments later in the season was not adequate.

TREATMENT	RATE (kg ai/ha)	GRAPE BERRY MOTH DAMAMGE[1] July 27	Sept 3
KARATE 50 EC	0.0100	12.4 ab* (24)[2]	25.4 a (21)
KARATE 50 EC	0.0125	5.6 cd (66)	19.6 a (39)
KARATE 50 EC	0.0150	3.9 cd (76)	15.4 a (52)
IMIDAN 50 WP	1.6500	3.3 d (80)	15.7 a (51)
CYMBUSH 250 EC	0.0600	8.4 bc (48)	19.2 a (41)
check	-	16.3 a	32.3 a

1. Average number of berries damaged per 30 bunches per plot.
2. Percent control relative to damage in check plots.

* Treatment means in the same column followed by the same letter are not significantly different at the 5% level (t-test).

CROP: Saskatoons (Amelanchier alnifolia Nutt.)

PESTS: Sawflies (Hoplocampa spp.) primarily

TITLE: CONTROL OF SAWFLIES DAMAGING SASKATOON BERRIES IN 1986

MATERIALS: AMBUSH (permethrin) 50 EC, DECIS (deltamethrin) 5 EC, DIAZINON (diazinon) 12.5 EC, METHOXYCHLOR (methoxychlor) 24 EC, MINTOX MBIS-16 (S.I.S. + Methoxychlor) 44 SN, SAFERS INSECTICIDAL SOAP (S.I.S.) 40 SN, SAFERS ID (S.I.S. + diazinon), SAP-404 (S.I.S. + pyrethrin), TRITON B-1956.

METHODS: Insecticides were applied with Green Cross Superspray GX50 hand sprayers to plots 10 m long X 2 m wide X 2 m high in 2.0 L distilled water + 0.25 ml spreader-sticker to a 12-year old orchard near Grande Prairie, Alberta. A completely randomized block design with 4 replicates was used, occupying 13 of 30 rows. Spray schedules used are shown in the table. Berry clusters, 18/plot, were collected at 1 and 3 weeks after 90% petal fall, and at harvest. The number of berries present, missing, with sawfly, and other types of insect damage were counted and analysed.

NAME AND AGENCY:

DAVIDSON, J.G.N. and NEIGHBOUR, S.A.
Agriculture Canada Research Station
BEAVERLODGE, Alberta T0H 0C0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All treatments significantly reduced sawfly damage to fruitlets and berries of saskatoons. Only 2 of the 3 pyrethroid insecticides (DECIS, SAP-404) had enough residual effectiveness to reduce damage by other insects (unidentified) that caused damage subsequent to the last spray date, and none of the others. None of the treatments significantly affected the no. of berries missing, i.e. dropped.

Some treatments that reduced sawfly damage had little effect on total insect damage, suggesting that some symptoms rated as being due to other insects are in fact due to sawflies also.

TREATMENT	SPRAY DATES	RATE PER APPLICATION g ai/m^2	BERRIES MISSING %	SAWFLY DAMAGE No. Berries	OTHER INSECT DAMAGE No. Berries
Check (d.w. + B-1956)	I II III -	(0.025)	23.1 ab*	4.2 a	5.5 ab
SAFERS INSECTICIDAL SOAP	I II - IV	2.25	23.4 ab	1.8 b	5.5 ab
SAFERS ID	I II III -	2.25 + 0.0225	20.6 b	0.7 b	5.1 ab
DIAZINON	I II III -	0.156	24.4 ab	0.3 b	6.0 a
MINTOX	I II - IV	2.25 + 0.225	20.3 b	0.8 b	4.3 ab
METHOXYCHLOR	I II III -	0.16	22.2 ab	0.0 b	4.7 ab
SAP-404	I II - IV	2.25 + 0.0225	22.6 ab	1.1 b	2.4 b
DECIS	I II III -	0.004	22.6 ab	1.1 b	2.4 b
AMBUSH	I II - IV	0.07	23.2 ab	0.1 b	5.0 ab

Dates: I = 25-50% bloom; II = 90% petal fall; III = 90% p.f. + 10 days; IV = 90% p.f. + 30 days.
* Values followed by the same letter are not significantly different, P = 0.05 (Duncan's Multiple Range Test)

CROP: Saskatoons (Amelanchier alnifolia Nutt.)

PESTS: Hoplocampa spp, + unidentified

TITLE: CONTROL OF INSECTS ATTACKING SASKATOON BERRIES

MATERIALS: CYGON (dimethoate) 48 EC , DECIS (deltamethrin) 5 EC, KARATE (PP321) 10 EC, THIODAN (endosulfan) 50 WP, TRITON B-1956

METHODS: Insecticides were applied to plots 2 m long X 1 m wide X 2 m high in 1.0 L distilled water + 0.25 ml spreader-sticker to a 15-year old orchard at the Beaverlodge Research Station, 1986. A completely randomized block with 4 replicates was used. Spray schedules used are shown in the table. Berry clusters, 12/plot, were collected at 1 and 3 weeks after 90% petal fall, and at harvest. The number of berries present, missing, with sawfly, and other insect damage were counted, and analysed.

NAME AND AGENCY:

DAVIDSON, J.G.N.
Agriculture Canada Research Station
BEAVERLODGE, Alberta T0H 0C0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: The level of sawfly damage proved to be very low, and to be the minor part of total insect damage. The overall level of insect damage was also low.

All insecticides reduced insect damage to saskatoon berries significantly. DECIS and CYGON were somewhat more effective than KARATE and THIODAN.

TREATMENT	SPRAY DATES	RATE PER APPLICATION g ai/m^2	BERRIES MISSING %	SAWFLY DAMAGE No. Berries	OTHER INSECT DAMAGE No. Berries
Check (d.w. + B-1956)	I + II + III	(0.025)	21.4 ab*	2.8 a	6.2 a
THIODAN	I + II + III	0.075	22.6 a	1.3 ab	4.2 bc
KARATE	I + II + III	0.01	20.8 ab	1.3 ab	3.9 bc
DECIS	I + II + III	0.01	19.4 ab	1.6 ab	3.0 c
CYGON	I + II + III	0.3	17.9 bc	1.1 ab	3.8 bc

Dates: I = 25-50% bloom; II = 90% petal fall; III = 10 days after 90% petal fall.
* Values followed by the same letter are not significantly different, P = 0.05 (Duncan's Multiple Range Test)

CROP: Saskatoons

PESTS: Sawflies (Hoplocampa spp.) + unidentified

TITLE: CONTROL OF SAWFLIES AND OTHER INSECTS DAMAGING SASKATOON BERRIES IN 1987

MATERIALS: CYGON (dimethoate) 4E, DECIS (deltamethrin) 5 EC, DIAZINON (diazinon) 12.5 EC, TRITON B-1956.

METHODS: Insecticides were applied with Green Cross GX50 hand sprayers to plots 10 m long X 2 m wide X 2 m high in 2.0 L distilled water + spreader-sticker at 2 locations: Beaverlodge Research Station (BRS) and at a private orchard near Grande Prairie (GP), Alberta, that were 16 and 13 years old respectively. A randomized block design with 4 replicates was used. Each plot was sprayed 4 X: leaf budbreak, after inflorescence extended but prior to white or pink bud, 90% petal fall, and 10 days after 90% petal fall. May-June, 1987.

Berry clusters, 10/plot, were collected at flowerbud prior to the first spray, at whitebud, 90% petal fall, 10 days after 90% petal fall, and at harvest. No. berries, no. berries missing, no. with sawfly damage, and no. with other types of insect damage were counted. The data were subjected to ANOVA.

The first two collections were solely to evaluate Lygus bug damage: none was found.

The CYGON plots only received the last 2 sprays. Plots were sprayed with CYGON on the first 2 dates, but accidently at 10 X the proper rate. This killed all foliage and flowers in a few days.

NAME AND AGENCY:

DAVIDSON, J.G.N. and S.A. NEIGHBOUR
Agriculture Canada Research Station
BEAVERLODGE, Alberta T0H 0C0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Overall fruit set was exceptionally low at both sites due mainly to a killing frost during flowering. It caused variable damage and is reflected in the higher than usual data for % berries missing. That they were not a good deal higher, however, is because only clusters with fruit, i.e. that had escaped most of the frost, were collected so that insect damage could be evaluated.

Insect damage was at a low level overall. Lygus bug damage was not found in the samples although present at a low level in the orchard. Thrips were present in small numbers in blossoms.

CYGON and DECIS produced significant reductions in sawfly damage at both locations, and DIAZINON at one of them. Total insect damage, some of which occurred after the last spray date, was reduced significantly only by DECIS at one site, and only by DIAZINON at the other. % berries missing was not reduced significantly at either site, apparently because the data were partly attributable to frost. No treatment improved the no. of berries/cluster at harvest.

CYGON was phytotoxic to berries, as shown by the significantly higher no. of berries missing and fewer berries/cluster. It also caused scorching and withering of immature leaves. At 10 X the proper rate, CYGON killed all green tissues. Slight recovery was noted in August on all affected bushes.

Although it is effective in controlling insect pests, CYGON is too toxic to saskatoons to be used any more on them.

INSECTICIDES	RATE /application g ai/m^2	SAWFLY no. berries damaged		TOTAL INSECT no. berries		BERRIES MISSING %		BERRIES/CLUSTER no. at harvest	
		BRS	GP	BRS	GP	BRS	GP	BRS	GP
CYGON	0.3	0 a*	0 a	2.3 b	3.3 ab	13.4 b	19.4 b	6.2 b	5.6 a
DECIS	0.015	0 a	0.05a	0.95a	2.3 ab	8.6 a	13.0 a	7.8 a	6.0 a
DIAZINON	0.15	0.4 ab	0.10a	3.0 b	1.1 b	9.2 a	14.9 ab	7.1 a	5.7 a
Check (d.w. + Triton)	(0.025)	0.75 b	0.45 b	2.3 b	2.6 a	10.7 ab	11.3 a	7.5 a	6.1 a

* Values in the same column followed by the same letter are not significantly different, P = 0.05 (Duncan's Multiple Range Test).

CROP: Saskatoons

PESTS: Sawflies (Hoplocampa spp.) + unidentified

TITLE: SCREENING INSECTICIDES FOR CONTROL OF SAWFLIES AND OTHER INSECTS DAMAGING SASKATOON BERRIES 1987

MATERIALS: AMBUSH (permethrin) 50 EC, DECIS (deltamethrin) 5 EC, DECIS (deltamethrin) 5 FL, KARATE (cyhalothrin) 10 EC, METHOXYCHLOR (methoxychlor) 24 EC, ORTHENE (acephate) 75 SP, THIODAN (endosulfan) 50 WP, TRITON B-1956.

METHODS: Insecticides were applied with Green Cross Superspray GX50 hand sprayers to plots 7 m long X 1.5 m wide X 2 m high in 2.0 L distilled water + spreader-sticker at 2 locations: Beaverlodge Research Station (BRS) and at a private orchard near Grande Prairie (GP), Alberta, that were 16 and 13 years old respectively. A randomized block design with 4 replicates was used. Each plot was sprayed 3 X: 90% petal fall (p.f.), 90% p.f. + 10 days, 90% p.f. + 30 days. May-July, 1987.

Berry clusters, 18/plot, were collected at 1 and 3 weeks after 90% petal fall, and at harvest. The number of berries present, missing, with sawfly, and other insect damage were counted. The data were subjected to ANOVA.

NAME AND AGENCY:

DAVIDSON, J.G.N. and S.A. NEIGHBOUR
Agriculture Canada Research Station
BEAVERLODGE, Alberta T0H 0C0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Overall fruit set was very low due mainly to a killing frost during flowering. It caused variable damage that is reflected in the higher than usual data for % berries missing. That they were not much higher, however, is because only those clusters with fruit, i.e. that had largely escaped frost damage, were sampled so that insect damage could be evaluated.

Sawfly damage was at a low level overall, but other insect damage reached moderate levels. Since the earliest application date was after damage done by such insects as Lygus bugs and Thrips, no control of them was possible, and their damage is reflected in the relatively high no.s for total insect damage. No. berries/cluster at harvest and % berries missing include frost and disease damage. Therefore the sawfly data give the best indication of the efficacy of insecticides used.

DECIS at the standard rate (I) was the most effective treatment. There was little difference between the EC and FL formulations except that the data suggest the FL formulation may be more persistent. At the GP site the latter caused significantly more fruitlet drop and fewer fruit/cluster at harvest. At the 1/10 rate (II) both formulations were somewhat less effective and, at the GP site, produced significantly less fruits.

KARATE, AMBUSH, and THIODAN controlled sawflies also.

THIODAN was phytotoxic: it caused 75% of the leaves to die, and the remainder had chlorotic or necrotic spots; berries did not ripen properly and stayed at the red stage. METHOXYCHLOR was moderately phytotoxic: leaves ranged from having small necrotic spots to being totally necrotic, but berries developed normally. This is the first time we have used THIODAN on saskatoons. However, METHOXYCHLOR has been used by us many times before, e.g. 1984 p. 78, 1986 p. 50, including at higher rates or frequencies, without any sign of phytotoxicity.

TREATMENT	RATE /application g ai/m^2	SAWFLY no. berries BRS	SAWFLY no. berries GP	TOTAL INSECT no. berries BRS	TOTAL INSECT no. berries GP	BERRIES MISSING % BRS	BERRIES MISSING % GP	BERRIES/CLUSTER no. at harvest BRS	BERRIES/CLUSTER no. at harvest GP
DECIS (EC) I	0.01	0.1 a*	0.5 a	10.9 ab	10.9 abc	17.5 a	18.6 a	6.2 a	6.1 a
DECIS (FL) I	0.01	0.5 ab	0.75a	7.4 a	6.4 a	18.0 a	35.4 c	5.9 ab	4.9 b
KARATE	0.001	0.9 abc	1.25a	10.9 ab	15.0 c	21.5 ab	28.1 ab	6.1 a	5.1 ab
AMBUSH	0.02	1.1 abc	--	9.75ab	--	17.6 a	--	6.75a	--
THIODAN	0.175	1.4 abc	0.12a	9.0 ab	9.1 ab	21.0 ab	24.0 ab	6.6 a	5.7 ab
DECIS (EC) II	0.001	1.4 abc	1.6 a	9.75ab	10.9 abc	22.2 bc	28.6 bc	5.9 ab	4.8 b
DECIS (FL) II	0.001	1.6 abcd	1.25a	13.75 bc	9.75abc	22.4 bc	29.4 bc	5.9 ab	4.9 b
METHOXYCHLOR	0.17	2.4 bcd	--	9.9 ab	--	26.4 c	--	4.2 b	--
ORTHENE	0.1	2.75 cde	2.6 a	9.4 ab	10.75abc	21.1 bc	27.0 b	5.7 ab	5.3 ab

* Values in the same column followed by the same letter are not significantly different, P = 0.05 (Duncan's Multiple Range Test).

CROP: Saskatoon, cv. Smoky

PESTS: Sawflies (unidentified); Thrips (Thrips spp.), Leaf miners (unidentified); Pear slug (Caliroa cerasi (L.))

TITLE: PHYTOTOXICITY AND EFFICACY OF INSECTICIDES ON SASKATOONS, 1987.

MATERIALS: DECIS 5 EC (deltamethrin 50 g/L), BASUDIN 50% EC (diazinon 500 g/L), DIMETHOATE 40 (dimethoate 400 g/L EC), TRITON B-1956 (modified pthalic glycerol alkyd resin, 77% SN).

METHODS: This trial was conducted in a saskatoon orchard at the ASCHRC, Brooks. The experimental design used was a randomized complete block with four replicates. Suitable bushes (average size 2.25m^2) were selected and color coded as to treatment. The required amount of chemical for each treatment was applied in two litres of water to two bushes in each of four replicates. The water control was applied to four bushes in each of four replicates. A CO_2-propelled, hand-held boom sprayer equipped with three TEE JET SS8002 fan nozzles spaced 45 cm apart and operated at 200 kPa was used in the vertical position to apply the insecticides. All treatments, including controls, contained the spreader-sticker Triton B-1956 at 0.45 mL/2L. All sprays were applied at the following growth stages: a) flower buds with influorescences extended but prior to white or pink bud, b) at 90% petal fall, and c) ten days after 90% petal fall. Thirty-six berry clusters (18/bush) per treatment per replicate were collected just prior to harvest and examined for number of berries present, berries missing (pedicel scars), and insect damage (exit holes and punctures). All bushes were visually examined for insect damage to the foliage and fruit. At harvest, two samples of ca. 300 grams of berries were collected from each pair of bushes per treatment per replicate and frozen for future residue analysis. Data were subjected to ANOVA.

NAME AND AGENCY:
HOWARD, R.J. and MOSKALUK, E.R.
Alberta Special Crops and Horticultural Research Center
Brooks, Alberta, T0J 0J0

DAVIDSON, J.G.N.
Agriculture Canada Research Station
Beaverlodge, Alberta, T0H 0C0

RESULTS: See Tables 1 and 2 below.

Phytotoxicity - All bushes sprayed with dimethoate exhibited moderate to severe leaf burning and cupping. No phytotoxic effects were visible on bushes which were treated with the other chemicals.

Fruit Development - Berries from bushes which received dimethoate were small, somewhat shrivelled, and less mature than berries from trees sprayed with the other chemicals.

Yield - None of the insecticides significantly increased the average number of berries per cluster or significantly reduced the percentage of missing berries relative to the check.

Insect Control - None of the insecticides provided significant control of thrips, sawflies or pear slugs; however, all three significantly reduced overall insect damage to the berries. Decis and dimethoate controlled leaf miners significantly better than diazinon.

CONCLUSIONS: Further studies on the timing of insecticide applications are required before a spray calendar can be developed for saskatoons.

Table 1. Yields and insect damage ratings on saskatoon berries treated with three insecticides[1].

Treatment	Rate/application (g a.i./m^2)	Berries at harvest (avg. no. cluster)	Berries missing[2] (%)	Sawfly berries* (avg. no./cluster)	Total insect-damaged berries (avg. no./cluster)
DECIS 5 EC	0.015	7.5	34	0.02	0.12a
DIAZINON 50 EC	0.15	7.8	33	0.07	0.22a
DIMETHOATE 40	0.30	8.0	27	0.04	0.23a
Water check	-	7.3	30	0.15	0.51 b
ANOVA (P<0.05)		NS	NS	NS	S

* 'Sawfly berries' refers to those berries with characteristic exit holes only.

Table 2. Percentage of saskatoon bushes damaged by insects after treatment with three insecticides[1].

Treatment	Rate/application (g a.i./m^2)	Bushes with insect damage (%)[2] Thrips	Leaf miners	Sawflies	Pear slugs
DECIS 5 EC	0.015	100	0 (0) a	13	63
DIAZINON 50 EC	0.15	100	75 (85) b	13	75
DIMETHOATE 40	0.30	100	0 (0) a	0	0
Water check	-	100	100 (100) b	0	50
ANOVA (P<0.05)		NS	S	NS	NS

1 All figures in Tables 1 and 2 are the means of four replications. Numbers followed by the same small letter are not significantly different according to a Duncan's Multiple Range Test (P<0.05).

2 Percentage data were arcsin transformed prior to analysis. Numbers reported are raw (untransformed) data, except for those in parentheses which are detransformed values.

CROP: Saskatoon, cv. Smoky

PESTS: Sawflies (unidentified); Thrips (Thrips spp.), Leaf miners (unidentified); Pear slug (Caliroa cerasi (L.))

TITLE: PHYTOTOXICITY AND EFFICACY OF INSECTICIDES ON SASKATOONS, 1987.

MATERIALS: DECIS 5 EC (deltamethrin 50 g/L), BASUDIN 50% EC (diazinon 500 g/L), DIMETHOATE 40 (dimethoate 400 g/L EC), TRITON B-1956 (modified pthalic glycerol alkyd resin, 77% SN).

METHODS: This trial was conducted in a saskatoon orchard at the ASCHRC, Brooks. The experimental design used was a randomized complete block with four replicates. Suitable bushes (average size 2.25m^2) were selected and color coded as to treatment. The required amount of chemical for each treatment was applied in two litres of water to two bushes in each of four replicates. The water control was applied to four bushes in each of four replicates. A CO_2-propelled, hand-held boom sprayer equipped with three TEE JET SS8002 fan nozzles spaced 45 cm apart and operated at 200 kPa was used in the vertical position to apply the insecticides. All treatments, including controls, contained the spreader-sticker Triton B-1956 at 0.45 mL/2L. All sprays were applied at the following growth stages: a) flower buds with influorescences extended but prior to white or pink bud, b) at 90% petal fall, and c) ten days after 90% petal fall. Thirty-six berry clusters (18/bush) per treatment per replicate were collected just prior to harvest and examined for number of berries present, berries missing (pedicel scars), and insect damage (exit holes and punctures). All bushes were visually examined for insect damage to the foliage and fruit. At harvest, two samples of ca. 300 grams of berries

NAME AND AGENCY:
HOWARD, R.J. and MOSKALUK, E.R.
Alberta Special Crops and Horticultural Research Center
Brooks, Alberta, TOJ OJO

DAVIDSON, J.G.N.
Agriculture Canada Research Station
Beaverlodge, Alberta, TOH OCO

were collected from each pair of bushes per treatment per replicate and frozen for future residue analysis. Data were subjected to ANOVA.

RESULTS: See Tables 1 and 2 below.
Phytotoxicity - All bushes sprayed with dimethoate exhibited moderate to severe leaf burning and cupping. No phytotoxic effects were visible on bushes which were treated with the other chemicals.
Fruit Development - Berries from bushes which received dimethoate applications were small, somewhat shrivelled, and less mature than berries from trees sprayed with the other chemicals.
Yield - None of the insecticides significantly increased the average number of berries per cluster or significantly reduced the percentage of missing berries relative to the check.
Insect Control - None of the insecticides provided significant control of thrips, sawflies or pear slugs; however, all three significantly reduced overall insect damage to the berries. Decis and dimethoate controlled leaf miners significantly better then diazinon.

CONCLUSIONS: Further studies on the timing of insecticide applications are required before a spray calendar can be developed for saskatoons.

Table 1. Yields and insect damage ratings on saskatoon berries treated with three insecticides.[1]

Treatment	Rate/application (g a.i./m^2)	Berries at harvest (avg. no./cluster)	Berries missing[2] (%)	Sawfly berries* (avg. no./cluster)	Total insect-damaged berries (avg. no./cluster)
DECIS 5 EC	0.015	7.5	34	0.02	0.12a
DIAZINON 50 EC	0.15	7.8	33	0.07	0.22a
DIMETHOATE 40	0.30	8.0	27	0.04	0.23a
Water check	-	7.3	30	0.15	0.51 b
ANOVA (P<0.05)		NS	NS	NS	S

* 'Sawfly berries' refers to those berries with characteristic exit holes only.

Table 2. Percentage of saskatoon bushes damaged by insects after treatment with three insecticides.[1]

Treatment	Rate/application (g a.i./m^2)	Bushes with insect damage (%)[2]			
		Thrips	Leaf miners	Sawflies	Pear slugs
DECIS 5 EC	0.015	100	0 (0) a	13	63
DIAZINON 50 EC	0.15	100	75 (85) b	13	75
DIMETHOATE 40	0.30	100	0 (0) a	0	0
Water check	-	100	100 (100) b	0	50
ANOVA (P<0.05)		NS	S	NS	NS

[1] All figures in Tables 1 and 2 are the means of four replications. Numbers followed by the same small letter are not significantly different according to a Duncan's Multiple Range Test (P<0.05).

[2] Percentage data were arcsin transformed prior to analysis. Numbers reported are raw (untransformed) data, except for those in parentheses which are detransformed values.

CROP: Saskatoons (Amelanchier alnifolia Nutt.)

PESTS: Lygus lineolaris (P. de B.)

TITLE: CONTROL OF LYGUS BUG DAMAGE TO SASKATOON FLOWER BUDS

MATERIALS: CYGON (dimethoate) 48 EC, DECIS (deltamethrin) 5 EC, DIAZINON (diazinon) 12.5 EC, METHOXYCHLOR (methoxychlor) 24 EC, TRITON B-1956.

METHODS: Insecticides were applied in distilled water + spreader-sticker with Green Cross Superspray GX50 hand sprayers in May 1986. In test A, the plots measured 10 X 1 X 1.5 m or the equivalent volume of smaller bushes. In tests B and C, the plots measured 4 X 1 X 1.8 m. Test C was applied, immediately after sampling, to the same plots as B since B did not seem to be effective. In all three, a randomized block with 4 replicates was used. The plots were in different parts of a commercial nursery located adjacent to both wild forest and cultivated alfalfa, near Hythe, Alberta.

Inflorescences, 10/plot, were collected from tests A and B at the first-flower-open growth stage, and from test C at about 20% bloom. Number of aborted flower buds or no. with sap exudate from feeding punctures were counted and analysed for each test.

NAME AND AGENCY:

DAVIDSON, J.G.N.
Agriculture Canada Research Station
BEAVERLODGE, Alberta T0H 0C0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Insect pressure was light to moderate from opening of the inflorescence bud until about 20% bloom. Lygus bugs fed on flower buds and sometimes on the inflorescence stem. Penetrated buds and inflorescence stems died.

In test A insect pressure was light, the bushes smaller and sparser. DECIS was very effective, and METHOXYCHLOR ineffective.

In tests B and C the insect pressure was much heavier, the bushes were larger and denser but those available for testing were much fewer. When 2 applications of DIAZINON (test B) appeared ineffective, CYGON was applied to the same bushes and the net effect was significantly be.ter.

These were small pilot tests whose results warrant further testing of DECIS and CYGON. However, following the CYGON application some slight signs of foliar scorch were noted on the youngest leaves, so caution is advisable.

OBSERVATION: It appeared that an earlier application as soon as the inflorescence bud opened and before inflorescence extension would have been even more beneficial.

TREATMENT	SPRAY DATES	RATE PER APPLICATION g ai/m^2	DAMAGED BUDS no./plot
A.			
Check (d.w. + TRITON B-1956)	I + II	(0.025)	10.0 a*
METHOXYCHLOR	I + II	0.16	8.6 a
DECIS	I + II	0.004	3.1 b
B.			
Check (d.w. + TRITON B-1956)	I + II	(0.025)	4.8 b
DIAZINON	I + II	0.156	2.2 b
C.			
Check (d.w. + TRITON B-1956)	III	(0.025)	10.0 a
CYGON	III	0.3	1.5 b

Dates: I = inflorescence extension; II = white tip; III = first flower open/cluster

* Values followed by the same letter are not significantly different, P = 0.05 (Duncan's Multiple Range Test)

CROP: Strawberry cv. Veestar

PEST: Tarnished Plant Bug, Lygus lineolaris (Palisot de Beauvois), Two-spotted spider mite, Tetranychus urticae (Koch)

TITLE: CONTROL OF TARNISHED PLANT BUG AND EFFECTS ON TWO-SPOTTED SPIDER MITE WITH CYMBUSH IN STRAWBERRIES

MATERIAL: CYMBUSH 250 g ai/L EC (cypermethrin).

METHODS: Treatments were applied to the same plots as in 1986, replicated three times and arranged according to a randomized complete block design. Rows were spaced 1.07 m apart and plots were 9.15 m long. Guard rows separated rows containing plots. As in 1986, plots received either one, two, or three applications of CYMBUSH 250 EC. CYMBUSH was diluted to a concentration comparable to 1000 L of water/ha. and applied to one set of plots May 8 (first bloom), a second set May 8 and May 22, and a third set treated May 8, May 22, and June 4. The May 8 and 22 treatments were timed to control tarnished plant bug (TPB). A truck-mounted sprayer with a Spraying Systems handgun fitted with a D-6 orifice plate was used to spray plots (ca. 1.5L/plot). Pressure was set at 1379 kPa. Plots were sampled for TPB damage on June 12 when 200 berries were picked/plot. Percentage injury was recorded and data were transformed using an Arcsin transformation prior to comparing treatment means using an analysis of variance and Duncan's multiple range test at the 0.05 significance level. Samples of 20 leaves/plot were taken on May 8, 22, and June 4 and examined for two-spotted spider mite (TSSM) eggs and active stages.

NAME AND AGENCY:
MARSHALL, D.B. and PREE, D.J.
Agriculture Canada, Research Station
Vineland Station, Ontario. L0R 2E0.

Numbers of Phytoseiids were also counted. Five of the 20 leaves were examined with a binocular microscope and the remaining 15 were first brushed using a Henderson-McBurnie mite brushing machine. Subsequent postspray samples were taken June 12, July 20 and Aug. 26. Data were recorded and analysed using an analysis of variance and Duncan's multiple range test at the 0.05 significance level.

RESULTS: As presented in the table below.

CONCLUSIONS: Significantly fewer strawberries were damaged by TPB in the plots treated with CYMBUSH than in the unsprayed control plots. TSSM was first detected in the June 4 sample. In the June 12 sample low numbers of TSSM were found in CYMBUSH plots receiving both two and three applications of CYMBUSH but by July 20, plots where CYMBUSH had been applied three times had significantly higher numbers of eggs and active stages than other plots. The first occurrence of Phytoseiid mites was in the Aug. 26 sample. They were present in all plots; but were most abundant in untreated controls, and plots receiving a single application of CYMBUSH on May 8. In 1986, three applications of CYMBUSH did not result in high TSSM numbers. However, in the second year significant increases in TSSM occurred when three applications of CYMBUSH were made.

OBSERVATIONS: No TSSM eggs or actives were found in the May 8 or 22 sample.

Treatment	No. of Applications	Rate g a.i. ha^{-1}	June 12 % fruit with TPB injury/plot	June 4 TSSM eggs/plot	June 4 TSSM actives[5]/plot	June 12 TSSM eggs/plot	June 12 TSSM actives/plot
CYMBUSH 250 EC[1]	3	100	0.5 a[4]	0 a	0 a	0.7 a	1.7 a
CYMBUSH 250 EC[2]	2	100	1.5 a	1.3 a	0.7 b	0.7 a	1.7 a
CYMBUSH 250 EC[3]	1	100	1.3 a	0 a	0 a	0 a	0 a
Control		-	8.0 b	0 a	0 a	0 a	0 a

Treatment	No. of Applications	July 20 TSSM eggs/plot	July 20 TSSM actives/plot	Aug. 26 TSSM eggs/plot	Aug. 26 TSSM actives/plot	Aug. 26 Phytos/plot
CYMBUSH 250 EC[1]	3	92.7 a	93.3 a	8.0 a	0 a	0.3 a
CYMBUSH 250 EC[2]	2	4.0 b	8.3 b	1.3 a	10.0 a	1.0 a
CYMBUSH 250 EC[3]	1	21.7 b	20.7 b	4.7 a	12.0 a	3.3 a
Control		5.0 b	6.0 b	4.0 a	2.7 a	2.7 a

[1] applied May 8, May 22, June 4
[2] applied May 8, May 22.
[3] applied May 8.
[4] mean followed by the same letter not significantly different ($P < 0.05$, Duncan's multiple range test).
[5] actives includes nymphs and adults.

CROP: Strawberry cv. Redcoat

PEST: Strawberry weevil, Anthonomus signatus Say
Tarnished plant bug, Lygus lineolaris P. de B.

TITLE: CHEMICAL CONTROL OF THE STRAWBERRY WEEVIL AND THE TARNISHED PLANT BUG

NAME AND AGENCY:
VINCENT, Charles
RANCOURT, Benoit
Research Station, Agriculture Canada
P.O. Box 457, St-Jean-sur-Richelieu
Quebec, Canada J3B 6Z8

MATERIALS: COMMON NAME (DOSAGE/100 L)

BRIGADE 10WP	: Bifenthrin	(25 g)
MALATHION 25WP	: Malathion	(56 g)
KARATE 50EC	: Cyhalothrin	(2.24 ml)
HOE 0000522 150EC	: Teflubenzuron	(4.48 ml)
DECIS 5F	: Deltamethrin	(3.36 ml)
CHECK	: Water	

METHODS: The trial was conducted in a strawberry plantation established in 1986 at the Experimental Farm of Frelighsburg, Qué. Each experimental unit consisted of 37 m longs rows, and there were 4 replications in a complete randomized design. Treatments were made on 4 June 1987, at full bloom, with a hand gun at 1790 kPa until run-off. Strawberry weevil damage was assessed by examining 10 floral hamps on 17 June and 26 June 1987. At harvest on 22, 29 June, the damages caused by tarnished plant bug and malformations due to mis-pollination were assessed on 1 m row.

RESULTS: The damage caused by the strawberry weevil was unusually high and the treatment applied represent a late treatment (Table 1). Under these conditions, KARATE, MALATHION and BRIGADE significantly provided better control (TOTAL CONTROL) than other treatments. Although not shown in table form, there were no significant damage due to bird pecking, which ranged from 0.7 to 3.12%. At harvest (Table 2), the best products in terms of clean fruits were MALATHION, BRIGADE and KARATE. MALATHION and BRIGADE were effective against the tarnished plant bug.

Table 1. Percentage of flowers clipped by the strawberry weevil, Anthonomus signatus

	June 17	June 26	TOTAL
HOE 000522 150 EC	15.3a*	13.4a	27.8a
CHECK	14.2a	16.7a	26.0ab
DECIS 5F	11.6a	13.6a	20.7bc
KARATE 50EC	13.9a	14.4a	14.4cd
MALATHION 25WP	12.7a	10.4a	13.1d
BRIGADE 10WP	11.8a	11.0a	12.6d

* Vertically, means followed by the same letters are not significantly different at P = 0.005, Duncan's Multiple range test.

Table 2. Percentage of clean fruit, fruit attacked by tarnished plant bug, Lygus lineolaris, and malformed fruit due to mis-pollination.

	% clean fruit	% fruit attacked by tarnished plant bug	% mis-pollinated fruit
HOE 000522 150EC	44.1c	27.2a	25.7a
CHECK	44.9c	26.0ab	22.9ab
DECIS 5F	56.9bc	20.7bc	16.8ab
KARATE 50EC	58.8abc	14.4cd	18.3ab
MALATHION 25WP	72.2a	13.1d	14.6b
BRIGADE 10WP	69.8ab	12.6d	14.6b

Insects of Vegetable and Special Crops

Insectes des légumes et cultures spéciales

Edited by / Révisé par
W.A. Charnetski; L.S. Thompson

CROP: Asparagus, cv. Viking 2K

PEST: Asparagus beetle, *Crioceris asparagi* (L.)

TITLE: ASPARAGUS BEETLE CONTROL

NAME AND AGENCY:
SEARS, M.K. and MCGRAW, R.R.
Department of Environmental Biology
University of Guelph
Guelph, Ontario N1G 2W1

MATERIALS: DECIS 2.5 EC and 5 F (deltamethrin), HOE 000522 150 F, and KARATE 50 EC (PP 321).

METHOD: A stand of asparagus in the fern stage was divided into plots consisting of 4 rows x 10 metres long. Rows were spaced at 1.7 m. Treatments were replicated 4 times in a randomized complete block design. Insecticides were applied on June 30, July 6 and July 28 using a tractor-mounted boom sprayer which delivered 675 L/ha at 800 kPa pressure. Evaluation of the treatments was performed 3 days after each application by counting the number of beetle larvae present on all ferns on each of 5 crowns selected randomly from the centre two rows of each plot.

RESULTS: Data are presented in Table 1.

CONCLUSIONS: A second application was required to bring the population of first generation beetles under control. A single application of all products controlled the later generation.

Table 1. Insecticide efficacy against asparagus beetle in asparagus, 1987.

Insecticide	Rate (ai/ha)	Mean[1] number of asparagus beetle larvae/5 crowns		
		July 3	July 10	July 31
DECIS 2.5 EC	5 g	26.0a	4.3b	8.8b
DECIS 5 F	5 g	26.3a	2.5b	5.3b
HOE 000522	15 g	43.5a	6.5b	5.5b
HOE 000522	25 g	10.5a	6.5b	15.8b
KARATE EC	10 g	55.5a	3.3b	3.8b
CHECK	-	30.0a	37.8a	32.8a

1. Means in each column followed by the same letter are not significantly different at P = 0.05 (Duncan's New Multiple Range Test).

CROP: Bean var. Tendergreen

PEST: Eastern field wireworm, Limonius agonus (Say)

TITLE: EVALUATION OF INSECTICIDES FOR THE CONTROL OF WIREWORMS IN BEANS, 1987

MATERIALS: AGROX DL Plus (15% diazinon, 25% lindane, 15% captan), AGROX DL + M (15% diazinon, 25% lindane, 10.5% metalaxyl) TF 3754 (PP 993 50 g/L), TF 3755 (PP 993 200 g/L), PP 993 1.5 G (15% PP 993)

METHODS: Seed samples were treated on April 28 and seeded May 15. Granular treatments were applied at seeding in a 15 cm band over the row and lightly incorporated. Plots consisted of 2 rows, 30 cm apart and 4 m in length with 25 seeds per row. Treatments were replicated 4 times in a randomized block design. Plants were considered damaged when the leaves and cotyledons showed evidence of wireworm feeding.
Location: Copetown, Ontario

NAME AND AGENCY:

ZANDSTRA, J.W.,
SMITH, D.B.
Chipman, A Business Unit of C-I-L Inc.
400 Jones Road
Stoney Creek, Ontario
L8G 3Z1

RESULTS: The results are summarized in the table below.

CONCLUSIONS: AGROX DL Plus significantly reduced emergence at the first assessment date, however, total emergence was not significantly affected by any treatment. Vigor was similar for all treatments. All treatments provided significant control of wireworms (as indicated by the number of damaged plants). AGROX DL + M appeared to be most effective in terms of percent control, however, it only reduced damage significantly more than TF 3754 at 0.3 g/kg seed and PP 993 1.5 G.

TREATMENT*	RATE[1]	EMERGENCE[2] May 28	EMERGENCE[2] June 8	VIGOR[3] June 8	DAMAGE[4] June 8	PERCENT[5] CONTROL
AGROX DL Plus	0.3 + 0.5 g	57 d**	86 a	6.8	1.6 ab	88
AGROX DL + M	0.3 + 0.5 g	60 cd	87 a	6.5	0.3 a	98
TF 3754	0.3 g	64 bcd	91 a	7.0	4.0 bc	71
TF 3754	0.4 g	72 ab	86 a	7.3	2.2 abc	84
TF 3755	0.4 g	68 abcd	89 a	6.5	2.3 abc	83
TF 3755	0.6 g	76 a	91 a	7.0	2.1 abc	85
PP 993 1.5G	0.9 g/100 m	77 a	89 a	7.0	3.5 bc	75
PP 993 1.5G	1.13 g/100 m	74 a	90 a	6.3	5.2 c	62
Check	-	68 abc	84 a	6.6	13.8 d	-

1. Active ingredient per kg of seed (insecticide component only) for treatments 1-6.
2. Average percent emergence.
3. Vigor rating (1 = very poor, 10 = excellent).
4. Average number of damaged seedlings per plot.
5. Percent control relative to numbers in the check plots.

* All seed pretreated with captan at 0.66 g ai/kg seed.
** Treatment means in the same column followed by the same letter are not significantly different at the 5% level (t-test).

CROP: Bean var. Scarlet runner

PEST: Seedcorn maggot, Delia platura (Meigen)

TITLE: EVALUATION OF INSECTICIDES FOR CONTROL OF SEEDCORN MAGGOTS IN BEANS, 1987

MATERIALS: AGROX DL Plus (15% diazinon, 25% lindane, 15% captan dry), AGROX DL + M (15% diazinon, 25% lindane, 10.5% metalaxyl dry), TF 3754 (50 g/L PP 993), TF 3755 (200 g/L PP 993), PP 993 1.5% G

METHODS: Seed samples were treated in jars and mixed on a roller for 15 minutes April 29. The trial was seeded by hand May 8. Plots consisted of 2 rows, each 4 meters long with 25 seeds per row and were replicated 4 times in a randomized block design. Untreated guard rows were placed on both sides of each block. Blood powder was sprinkled over each row following seeding and watered in. Numbers of seedlings emerged, vigor, and damage caused by the seedcorn maggot were recorded.
Location: Burlington, Ontario

NAME AND AGENCY:

SMITH, D.B.
Chipman, A Business Unit of C-I-L Inc.
400 Jones Road
Stoney Creek, Ontario
L8G 3Z1

RESULTS: The results are summarized in the table below.

CONCLUSIONS: No signif cant differences in emergence were observed. Vigor with all treatments except TF 3755 at 0.4 g ai/kg seed was equal to or higher than that in the check plots. Vigor was highest with AGROX DL Plus. All treatments except PP 993 1.5 G at 0.9 g ai/100 m provided significant control of seedcorn maggot. Significantly fewer damaged plants were observed with all seed treatments except TF 3754 at 0.3 g ai/kg seed than with granular treatments. PP 993 seed treatment performed equal to the standard AGROX DL Plus.

TREATMENT*	RATE[1]	EMERGENCE[2] May 21	EMERGENCE[2] May 2	VIGOR[3] May 26	DAMAGE[4] May 26	PERCENT[5] CONTROL
AGROX DL Plus	0.3 + 0.5 g	42 a**	88 a	6.8	0.5 a	94
AGROX DL + M	0.3 + 0.5 g	43 a	84 a	6.5	0.0 a	100
TF 3754	0.3 g	25 a	89 a	5.5	1.3 ab	84
TF 3754	0.4 g	40 a	87 a	6.5	0.2 a	98
TF 3755	0.4 g	20 a	83 a	5.0	0.2 a	98
TF 3755	0.6 g	41 a	90 a	6.5	0.7 a	91
PP 993 1.5G	0.9 g/100 m	44 a	81 a	6.5	4.2 bc	47
PP 993 1.5G	1.13 g/100 m	30 a	80 a	5.8	4.0 b	49
Check	-	29 a	81 a	5.5	7.9 c	-

1. Active ingredient per kg of seed (insecticide component only) for treatments 1-6.
2. Average percent emergence (50 seeds per plot).
3. Vigor rating (1 = very poor, 10 = excellent).
4. Average number of damaged seedlings per plot.
5. Percent control relative to numbers in the check plots.

* All seeds pretreated with captan at 0.9 g ai/kg seed.
** Treatment means in the same column followed by the same letter are not significantly different at the 5% level (t-test).

CROP: Cabbage, cv. Evergreen Ballhead

PEST: Imported cabbageworm, Artogeia rapae (L.)

NAME AND AGENCY:
SEARS, M.K. and MCGRAW, R.R.
Department of Environmental Biology
University of Guelph
Guelph, Ontario N1G 2W1

TITLE: INSECT CONTROL ON CABBAGE

MATERIALS: LAB 166801 100 SC, HOE 000522 150 F, DECIS 5 F (deltamethrin), CAPTURE 240 EC (bifenthrin), and JAVELIN WP (Bacillus thuringiensis).

METHODS: Cabbage seedlings were transplanted on June 19 in rows 0.9 m apart. On August 4 and 21, the insecticides were applied to 4 row x 14 m plots at a rate of 800 L/ha using a tractor-mounted boom sprayer. Treatments were replicated four times in a randomized complete block design. Treatments were evaluated on August 12, 19 and 27. The August 19 assessment showed that the population of larvae had not as yet recovered in the CAPTURE treatments; therefore it was not re-applied at this time. Five plants from the two centre rows of each plot were removed and examined for larvae.

RESULTS: Data are presented in Table 1.

CONCLUSIONS: The imported cabbageworm population was the only one large enough to assess. All insecticides used were effective in reducing the numbers of this pest. A single application of CAPTURE on August 4 was sufficient to control the larvae for the duration of the experiment.

TABLE 1. Insecticide erficacy on cabbage, 1987. Mean[1] number of imported cabbageworms (ICW) per 5 plants.

Insecticide	Formulation (g/L)	Rate (g ai/ha)	ICW		
			Aug. 12	Aug. 19	Aug. 27
LAB 166801 SC	100	100	7.0b	9.5bc	1.0b
HOE 000522	150	30	5.0b	12.8b	4.0b
HOE + DECIS 5 F	150 + 50	30 + 5	4.0b	9.5bc	5.5b
DECIS 5 F	50	5	4.5b	15.5ab	5.0b
CAPTURE 240 EC	240	12	0.3b	0.3c	2.8b
CAPTURE 240 EC	240	36	0.0b	0.5c	1.0b
JAVELIN (R.t.)	32,000 I.U.	250	4.0b	12.5b	3.0b
JAVELIN (R.t.)	32,000 I.U.	250	1.3b	9.3bc	1.5b
CHECK	-	-	32.5a	22.8a	17.3a

1. Means in each column followed by the same letter are not significantly different at P = 0.05 (Duncan's New Multiple Range Test).

CROP: Cabbage, cv. Houston Evergreen

PEST: Imported cabbageworm (ICW), Artogeia rapae (L.) and diamondback moth (DBM), Plutella xylostella

TITLE: CONTROL OF IMPORTED CABBAGEWORM AND DIAMONDBACK MOTH, 1987.

MATERIALS: POUNCE 3.2 EC (permethrin), HOE 00522 (teflubenzuron), CAPTURE 2 EC (bifenthrin).

METHODS: Seeds were planted at Upton, P.E.I. on June 10, 1987. Seeds were spaced at ca. 91 cm between rows and at ca. 8 cm within rows. Plants were thinned to a within row spacing of ca. 45 cm on July 20. Each four row plot measured 3.7 m x 5.0 m. The outer row of each plot and the first and last plant in each row served as a buffer. Plots were arranged in a randomized complete block design with five treatments each replicated four times. Insecticides were applied on August 21 with a CO_2 precision sprayer equipped with two disc-core hollow cone nozzles per row. The sprayer delivered ca. 340 L of spray mixture per ha at a pressure of ca. 240 kPa. The check plots received water only. Plants were sampled on August 20 (pre spray), August 25 and 28, and September 4. The number of larvae of ICW and DBM were counted on 40 plants per treatment on each sampling date. Analyses of variance and Duncan's Multiple Range Tests were performed on the data.

NAME AND AGENCY:
STEWART, J.G. and L.S. THOMPSON
Agriculture Canada, Research Station
Charlottetown, Prince Edward Island
C1A 7M8

RESULTS: Results are summarized in the table below.

CONCLUSIONS: Effective control of larvae of ICW was achieved with POUNCE 3.2 EC at 70 g a.i./ha, and CAPTURE at 12 and 24 g a.i./ha four days after application. HOE 00522 provided good control of larvae of ICW but was slower acting compared with the other insecticides.

All insecticides tested were less effective against larvae of DBM. Lower populations of larvae of DBM could be responsible for the lower efficacy of the insecticides.

SPECIES	PRODUCT	RATE (g a.i./ha)	Mean[1] No. Larvae/Plant (± S.E.) Aug. 20	Aug. 25	Aug. 28	Sept. 4
ICW	POUNCE 3.2 EC	70	5.1^{a2} ± 0.4	0.2^{a} ± 0.1	0.2^{a} ± 0.1	0.2^{a} ± 0.1
	HOE 00522	45	5.0^{a} ± 0.5	2.0^{b} ± 0.5	0.7^{a} ± 0.2	0.5^{a} ± 0.2
	CAPTURE	12	5.4^{a} ± 0.9	0.0^{a} ± 0.0	0.0^{a} ± 0.0	0.1^{a} ± 0.0
	CAPTURE	24	3.6^{a} ± 1.0	0.0^{a} ± 0.0	0.0^{a} ± 0.0	0.0^{a} ± 0.0
	Check	0	4.0^{a} ± 0.4	4.3^{c} ± 0.8	2.8^{b} ± 0.5	2.8^{b} ± 0.2
DBM	POUNCE 3.2 EC	70	0.7^{a} ± 0.3	0.2^{a} ± 0.1	0.2^{a} ± 0.0	0.2^{a} ± 0.1
	HOE 00522	45	0.7^{a} ± 0.3	1.0^{b} ± 0.2	0.8^{ab} ± 0.3	1.0^{a} ± 0.2
	CAPTURE	12	0.8^{a} ± 0.3	0.1^{a} ± 0.1	0.2^{a} ± 0.1	0.2^{a} ± 0.1
	CAPTURE	24	0.6^{a} ± 0.2	0.0^{a} ± 0.0	0.1^{a} ± 0.1	0.2^{b} ± 0.1
	Check	0	0.6^{a} ± 0.3	2.0^{c} ± 0.4	1.3^{b} ± 0.4	4.5^{b} ± 1.6

[1]Each mean is the average of four replicates with ten observations per replicate.
[2]Numbers in a column within each species followed by the same letter are not statistically different ($p = 0.05$; Duncan's Multiple Range Test).

CROP: Canola, cv. Westar

PEST: Crucifer flea beetle, Phyllotreta cruciferae
Striped flea beetle, Phyllotreta striolata

TITLE: LANCE EVALUATION FOR FLEA BEETLE CONTROL IN CANOLA.

MATERIALS: LANCE (cloethocarb 480 g/L)
VITAVAX RS (lindane 680 g/L, thiram 90 g/L, carbathiin 45 g/L)
flea beetle cages.

METHODS: Westar canola treated with Lance and Vitavax at the rates indicated in the tables below was seeded at 5 kg/ha at a depth of 2 cm on June 4, 1987 on clay loam at Minto, Manitoba. A cone-seeder with a 18 cm row spacing was used. Plots were 2.2 x 7.5m, and were replicated 4 times in a randomized complete block design. Two days after the crop emerged, 3 flea beetle cages per plot were established, each with 10 beetles, giving a total of 30 insects per plot. White sand was packed into the bottom of the cages to facilitate counting. Three bioassays were conducted: the first at 4&5 days after emergence, the second at 14&15 DAE, and the third at 22 DAE. Counts were taken at 48&72 hours after flea beetle introduction for bioassays 1&2, while a single count at 72 hours was taken for the last bioassay.

NAME AND AGENCY:
ROURKE, D.R.S.
Ag-Quest
Independent Agricultural Research Services
Box 144
MINTO, Manitoba ROK 1MO

RESULTS: The results are summarized in the tables below.

CONCLUSIONS: Bioassay 1 was initiated 4 DAE. Lance gave 100% control at all rates compared to 95% with Vitavax. Seedling damage was minimal. Insecticidal control for bioassay 2 (initiated 14 DAE) was at diminished levels, ranging from 48 to 74% for the low and high rates respectively. The count the following day showed control had increased to 64 and 84% for the low and high rates. Lance control compared very favorably to that of the Vitavax standard. Control was minimal for bioassay 3 (22 DAE), with 15% as the maximum from the high rate of Lance. Flea beetle damage was not a factor in the yield response due to low flea beetle pressure, except in the cages. Yields were not significantly different, indicating good tolerance. However, the highest yield was obtained with the low rate of Lance. The high Lance rate showed some phytotoxicity symptoms, namely slightly lower yields and initial injury consisting of a slight browning on the leaf margin and leaf cupping.

Table 1. Westar Response to Lance and Vitavax Seed Treatments - +4 - +15 Days[a]

		1st Bioassay						2nd Bioassay					
Trtmt	Rate gai/454g seed	Alive per 30 +4d	Damage[b] cage +4d	Damage[c] trtmt +4d	Alive per 30 +5d	Damage cage +5d	Damage trtmt +5d	Alive per 30 +14d	Damage cage +14d	Damage trtmt +14d	Alive per 30 +15d	Damage cage +15d	Damage trtmt +15d
1. Check	---	16a	2.75a	0.63a	14a	2.88a	0.8a	22a	2.13a	2.13a	19a	2.25a	2.38a
2. Lance	3.0	0b	0.88b	0.0 b	0b	0.88b	0.0b	11b	1.13b	1.25b	7b	1.13b	1.38b
3. Lance	5.4	0b	0.88b	0.0 b	0b	0.88b	0.0b	9b	1.13b	1.13b	7b	1.13b	1.13b
4. Lance	7.0	0b	0.75b	0.0 b	0b	0.75b	0.0b	5b	0.63b	0.75b	3b	0.63b	0.75b
5. Vitavax[d]		1b	0.75b	0.0 b	1b	0.75b	0.0b	20a	0.75b	0.88b	16a	1.13b	1.00b
LSD		3.292	.4717	.3298	2.712	.5119	.3445	6.732	.5537	.6926	6.000	.5883	.7274

Table 2. Westar Response to Lance and Vitavax Seed Treatments and % Mortalities[a]

		3rd Bioassay			1st Bioassay		2nd Bioassay		3rd Bioassay		
		Alive	Damage[b]	Damage[c]	mortality[e] %		mortality %		mortality %	Phyto	
Trtmt	Rate gai/454g seed	per 30 +22d	cage +22d	trtmt +22d	+4d	+5d	+14d	+15d	+22d	0-9 +2d	Yield kg/ha
1. Check	---	23ab	1.13a	1.38a	--	--	--	--		9.0	1544a
2. Lance	3.0	25a	1.00a	1.00b	100.0a	100.0a	48.0a	64.0a	-8.3b	9.0	1740a
3. Lance	5.4	22ab	1.00a	0.88b	100.0a	100.0a	54.0a	63.0a	5.0a	8.5	1632a
4. Lance	7.0	20b	0.88a	0.75b	100.0a	100.0a	74.3a	84.0a	15.0a	7.75	1687a
5. Vitavax[d]		22ab	1.00a	1.00b	94.5a	94.5a	6.5b	19.3b	3.3ab	8.75	1659a
LSD		3.739	.2332	.2899	8.797	8.797	30.76	32.68	12.65	.7442	368.4

[a]Values in the same column which are followed by the same letter do not differ significantly at the 5% level (Duncan's MRT).
[bc]Damage ratings are on a 0-4 scale and were assessed at each count for both inside the cages and in the rest of the plot for all treatments.
[d]Vitavax standard rate = 22.5ml/kg seed.
[e]%mortality was calculated using Abbott's Formula.

CROP: Canola, cv. Topas

PEST: Crucifer flea beetle, Phyllotreta cruciferae (Goeze) and striped flea beetle, Phyllotreta striolata (Fabr.).

TITLE: CONTROL OF FLEA BEETLE IN CANOLA BY SEED TREATMENTS, FOLIAR AND GRANULAR INSECTICIDES

MATERIALS: See Table 1.

METHODS: Seed treatments were measured volumetrically and added to a 0.5 kg sample of seed. The sample was mixed for 15 min and allowed to dry. The appropriate amount of seed for each plot was taken from the mixture and placed into individual packets. Granular insecticides were weighed and added to the appropriate packets of preweighed seed. Foliar treatments were applied May 11 and May 21 by manually pumped backpack sprayer at a rate of 450 L/ha. The seeding rate was equivalent to 2 million plants per hectare. Plots of canola were sown on April 24 using a 6-row, tractor-mounted cone seeder that evenly delivered treated seed and/or granular insecticides to rows spaced 20.0 cm apart. Plots were trimmed to 5.5 m after seedlings emerged. The number of plants in each plot was estimated by counting two rows (11 m) just after emergence and at harvest. After emergence the growth stage of seedlings and damage caused by flea beetles was recorded each week until the main raceme began to elongate. A damage index was assigned to 10 samples of 3 plants each from the middle 4 rows of each plot. Damage to the two innermost (youngest) leaves was recorded as 0 = no damage, 0.5 = ≤ 10%, 1.0 = 11-25%, 2.0 = 26-50%, 3.0 = 51-75%, and 4.0 = 76-100% of the leaf area consumed. Analysis of variance was performed on the mean of the 10 observations per plot. All six rows of each plot were harvested with a combine. Seed was cleaned to remove chaff, stalks and damaged seed. Sample weight was converted to equivalent kg/ha before analysis.

NAME AND AGENCY:
SEARS, M.K. and MCGRAW, R.R.
Department of Environmental Biology
University of Guelph
Guelph, Ontario N1G 2W1

RESULTS: Listed in Table 1.

CONCLUSIONS: All treatments and combinations of treatments gave excellent control of the flea beetle. Yields were increased significantly when compared to the untreated plots. All treatments provided control for the duration of the experiment with the exception of CAN-O-JET, which was losing its effectiveness after 4 weeks.

TABLE 1. Damage to canola foliage by flea beetles and yield of plots seeded with insecticide-treated seed and with foliar and granular insecticides, 1987.

Material	Formulation	Rate of Application prod/kg seed	Mean Damage Rating[1] May 13	May 21	May 26	June 1	June 8	Yield
VITAVAX RS	680 g/L	22.5 ml	0.4cdefgh	0.6cd	0.9bcd	0.8b	0.1bcde	1445abc
UBI 2513	423.4 g/L	20 ml	0.6cd	0.7cd	0.7cdefg	0.7bc	0.2bcd	1543abc
UBI 2513	423.4 g/L	30 ml	0.4cdefgh	0.4d	0.5defg	0.4def	0.2bcd	1492abc
UBI 2511	440 g/L	20 ml	0.4cdefgh	0.6cd	0.8bcdef	0.8b	0.2bcd	1431bc
UBI 2511	440 g/L	30 ml	0.1h	0.4d	0.5efg	0.5cd	0.2bc	1403bc
LANCE (cloethocarb)	480 g/L	29 ml	0.2fgh	0.3d	0.5defg	0.5cde	0.1cde	1313c
LANCE	480 g/L	63 ml	0.3fgh	0.3d	0.5fg	0.4def	0.1cde	1407bc
LANCE	480 g/L	104 ml	0.3efgh	0.4d	0.5defg	0.2ef	0.0e	1535abc
LANCE	10 G	560 g	0.5cde	1.0bc	0.6cdefg	0.3def	0.1cde	1551abc
COUNTER (terbufos)	5 G	1120 g	0.4cdefg	0.7cd	0.7bcdefg	0.4def	0.1de	1560abc
FURADAN (carbofuran)	CRIO	560 g	0.6c	1.0bc	0.8bcdef	0.5cd	0.1cde	1402bc
VITAVAX + LANCE	680 g/L + 10 G	22.5 ml + 560 g	0.2gh	0.4d	0.5efg	0.4def	0.1cde	1691a
VITAVAX + COUNTER	680 g/L + 5 G	22.5 ml + 1120 g	0.3defgh	0.6cd	0.5defg	0.4def	0.1cde	1501abc
VITAVAX + FURADAN	680 g/L + CRIO	22.5 ml + 560 g	0.3fgh	0.6cd	0.6defg	0.3def	0.1cde	1497abc
FURADAN + STICKER (foliar)	480 g/L	117 ml + 280 g ai/ha + 180 g ai/ha	0.4cdef	0.4d	0.4g	0.2f	0.1de	1592ab
FURADAN + STICKER (foliar)		117 ml + 180 g ai/ha	0.5cdef	0.4d	0.5fg	0.4def	0.1cde	1516abc
CANO-O-JET	5 kg seed/ha		0.4cdefg	0.7cd	0.9bc	1.1a	0.2b	1440abc
TF 3607	592 g/L	28 ml	0.3defgh	0.7cd	1.0b	0.9b	0.1cde	1564abc
CONTROL	-	-	1.3a	2.0a	1.7a	1.3a	0.5a	1087d

1. Means in each column followed by the same letter are not significantly different at P = 0.05 (Duncan's New Multiple Range Test).

CROP: Canola cv. Westar

PEST: Diamondback moth, Plutella xylostella (Linnaeus) and Bertha armyworm, Mamestra configurata Walker.

TITLE: KARATE RATES AND FORMULATION EFFECTS ON LATE SEASON LEPIDOPTERA PESTS IN CANOLA, 1987

MATERIALS: KARATE FL (87 g/L PP 321), KARATE EC (100 g/L PP 321), DECIS 5EC (50 g/L deltamethrin)

METHODS: Westar canola was seeded near Speers, Saskatchewan into clay loam on June 6, 1987. Seeding depth was 1 cm and row spacing was 18 cm. All chemical treatments were applied on July 23, 1987 at 19:00 hours, air temperature was 20°C, and wind was 5 gusting to 8 km/hr. The chemicals were applied in 110 L/ha of water using a hand-held boom sprayer equipped with six 8001 SS TeeJet nozzles spaced 50 cm and set 50 cm above the crop. The crop at application was fully podded. Plot size was 6 x 6m. Experimental design was a randomized complete block with 4 replications.
Location: Speers, Saskatchewan

NAME AND AGENCY:

PARTYKA, E.F.
Chipman, A Business Unit of C-I-L Inc.
2108C St. George Avenue
Saskatoon, Saskatchewan
S7M 0K7

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All chemical treatments significantly reduced populations of larvae. There were no phytotoxic effects noticed with any of the treatments tested.

TABLE ONE: CONTROL OF DIAMONDBACK MOTH

Treatment	Rate kg ai/ha	MEAN COUNT OF LARVAE PER 5 PLANTS[1]			
		Prespray	1 day	3 days	7 days
KARATE FL	0.0050	5.3 a	0.2 a	1.3 b	0.5 a
KARATE FL	0.0075	4.3 a	0.0 a	0.0 a	0.6 ab
KARATE EC	0.0050	5.0 a	0.0 a	0.0 a	0.4 a
KARATE EC	0.0075	10.0 a	0.2 a	0.0 a	0.6 ab
DECIS 5EC	0.0050	4.0 a	0.0 a	0.0 a	0.6 ab
Untreated	-	7.5 a	10.1 b	9.7 c	9.4 c

TABLE TWO: CONTROL OF BERTHA ARMYWORM

Treatment	Rate kg ai/ha	MEAN COUNT OF LARVAE PER SQUARE METER[1]			
		Prespray	1 day	3 days	7 days
KARATE FL	0.0050	2.0 a	0.0 a	0.0 a	0.3 a
KARATE FL	0.0075	3.5 a	0.0 a	0.0 a	0.0 a
KARATE EC	0.0050	2.8 a	0.0 a	0.0 a	0.2 a
KARATE EC	0.0075	4.8 a	0.0 a	0.0 a	0.4 a
DECIS 5EC	0.0050	4.0 a	0.0 a	0.0 a	0.0 a
Untreated	-	3.8 a	6.0 b	6.1 b	4.1 b

1. Treatment means in the same column followed by the same letter are not significantly different at the 5% level (t-test).

CROP: Canola cv. Tobin

PEST: Diamondback moth, Plutella xylostella (Linnaeus) and Bertha armyworm, Mamestra configurata Walker.

TITLE: KARATE RATES AND FORMULATION EFFECTS ON LATE SEASON LEPIDOPTERA PESTS IN CANOLA, 1987

MATERIALS: KARATE FL (87 g/L PP 321), KARATE EC (100 g/L PP 321), DECIS 5EC (50 g/L deltamethrin)

METHODS: Tobin canola was seeded near Keatley, Saskatchewan into clay loam on June 6, 1987. Seeding depth was 1 cm and row spacing was 18 cm. All chemical treatments were applied on July 23, 1987 at 17:00 hours, air temperature was 23°C, and wind was 5 gusting to 8 km/hr. The chemicals were applied in 110 L/ha of water using a hand-held boom sprayer equipped with six 8001 SS TeeJet nozzles spaced 50 cm and set 50 cm above the crop. The crop at application was fully podded. Yields were taken using a small plot combine harvesting a 7.8 m^2 portion of each plot. Experimental design was a randomized complete block with 4 replications.
Location: Speers, Saskatchewan

NAME AND AGENCY:

PARTYKA, E.F.
Chipman, A Business Unit of C-I-L Inc.
2108C St. George Avenue
Saskatoon, Saskatchewan
S7M 0K7

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All chemical treatments significantly reduced populations of larvae. Yields are variable due to lodging and a sclerotinia infection in experiment.

TABLE ONE: CONTROL OF DIAMONDBACK MOTH

Treatment	Rate kg ai/ha	MEAN COUNT OF LARVAE PER 5 PLANTS[1]			
		Prespray	1 day	3 days	7 days
KARATE FL	0.0050	27.0 a	0.9 a	0.2 a	0.2 a
KARATE FL	0.0075	0.5 a	0.2 a	0.0 a	0.2 a
KARATE EC	0.0050	3.8 a	0.2 a	0.0 a	1.1 a
KARATE EC	0.0075	22.8 a	0.0 a	0.0 a	0.4 a
DECIS 5EC	0.0050	5.0 a	0.2 a	0.0 a	0.6 a
Untreated	-	7.8 a	12.1 b	9.1 b	7.5 b

TABLE TWO: CONTROL OF BERTHA ARMYWORM

Treatment	Rate kg ai/ha	MEAN COUNT OF LARVAE PER SQUARE METER[1]				Yield g/m^2
		Prespray	1 day	3 days	7 days	
KARATE FL	0.0050	5.0 a	0.9 b	0.2 a	0.2 ab	400 a
KARATE FL	0.0075	4.3 a	0.0 a	0.0 a	0.0 a	335 a
KARATE EC	0.0050	8.3 a	0.0 a	0.0 a	1.2 c	355 a
KARATE EC	0.0075	3.8 a	0.0 a	0.0 a	0.4 abc	354 a
DECIS 5EC	0.0050	5.0 a	0.0 a	0.0 a	0.9 bc	410 a
Untreated	-	4.8 a	7.0 c	4.1 b	5.7 d	300 a

1. Treatment means in the same column followed by the same letter are not significantly different at the 5% level (t-test).

CROP: Cauliflower, cv. Anders

PEST: Imported Cabbage Worm, Pieris rapae

TITLE: IMPORTED CABBAGE WORM CONTROL WITH DECIS FORMULATIONS

MATERIALS: DECIS (deltamethrin) 5EC, DECIS 20F, DECIS 5F, DECIS 5WP.

METHODS: Cabbage was transplated on June 25, 1987 in 55cm rows. Plots were 3 rows wide and 5m long. All evaluations were taken from the middle row. Insecticides were applied using a backpack CO_2 cylinder sprayer delivering 123 L/ha at 275 kPa.The sprayer was equipped with 110015 nozzles. Insecticide applications were made on July 14, July 21, July 30 and August 10. Insecticide efficacy was evaluated by taking five plants/plot and counting the number of imported cabbage worm larvae present on August 28. The experiment was a randomized complete block design with 4 replicates.

NAME AND AGENCY:
DOBSON, C. and DREXLER, D.
HOECHST CANADA INC.
1800-330 Portage Avenue
Winnipeg, Manitoba R3C 0C4

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All DECIS formulations resulted in equally high levels of imported cabbage worm control.

TREATMENT	RATE (g ai/ha)	IMPORTED CABBAGE WORM CONTROL # OF LARVAE PER 5 PLANTS
Control	--	4.25 a[1]
DECIS 5EC	5	0 b
DECIS 5F	5	0 b
DECIS 20F	5	0 b
DECIS 5WP	5	0 b

[1]Values followed by the same letter are not significantly different (P=0.05) according to Duncan's New Multiple Range Test.

CROP: Cauliflower, cv. Dominant

PESTS: Imported cabbageworm (ICW), Artogeia rapae (L.) and diamondback moth (DBM), Plutella xylestella (L.)

TITLE: EFFECT OF SPRAY VOLUME ON THE EFFICACY OF BACILLUS THURINGIENSIS AGAINST LARVAE OF THE IMPORTED CABBAGEWORM AND THE DIAMONDBACK MOTH ON CAULIFLOWER, 1987.

MATERIALS: DIPEL WP (Bacillus thuringiensis).

METHODS: Seeds were planted at Upton, P.E.I. on June 18, 1987. Seeds were spaced at ca. 15 cm within rows and at ca. 90 cm between rows. Plants were thinned to a within row spacing of ca. 45 cm on July 20. Each four row plot measured ca. 3.6 m x 5.0 m. The outer row of each plot and the first and last plant in each row served as a buffer. Plots were arranged in a randomized complete block design with three treatments replicated four times. The treatments were: a check, ca. 350 L of water per ha; DIPEL WP at 8.8 B.I.U./ha in ca. 350 L of water per ha, and DIPEL WP at 8.8 B.I.U./ha in ca. 700 L of water per ha. Plots were sprayed twice to achieve the higher volume of water per ha. The sprayer was equipped with two disc-core hollow cone nozzles per row and operated at a pressure of ca. 240 kPa. Plants were sampled on August 27 (pre spray) and September 4 (post spray). The number of larvae of ICW and DBM were counted on 20 plants per treatment on each sampling date. Analyses of variance and Duncan's Multiple Range Tests were performed on the data.

NAME AND AGENCY
STEWART, J.G. and THOMPSON, L.S.
Agriculture Canada, Research Station
Charlottetown, Prince Edward Island
C1A 7M8

RESULTS: Results are summarized in the table below.

CONCLUSIONS: Increasing the spray volume from ca. 350 L/ha to ca. 700 L/ha did not enchance the efficacy of DIPEL WP against larvae of ICW and DBM on cauliflower. DIPEL WP was more effective against larvae of ICW than against larvae of DBM.

TREATMENT	SPRAY VOLUME (L/ha)	MEAN[1] NO. LARVAE/PLANT (±S.E.)			
		ICW		DBM	
		Pre spray	Post spray	Pre spray	Post spray
DIPEL WP	350	6.5[a2] ± 1.5	1.3[a] ± 0.5	1.5[a] ± 0.5	3.4[a] ± 0.6
DIPEL WP	700	6.7[a] ± 0.6	1.1[a] ± 0.2	1.6[a] ± 0.5	3.3[a] ± 1.0
Check	350	5.4[a] ± 1.0	4.1[b] ± 1.0	1.4[a] ± 0.5	5.1[a] ± 1.0

[1]Means are the average of four replicates with five observations per replicate.
[2]Numbers in a column followed by the same letter are not statistically different (p=0.05, Duncan's Multiple Range Test).

CROP: Onions, var. Autumn Spice

PEST: Onion maggot, Delia antiqua (Meig.)

NAME AND AGENCY:
RITCEY, G., McEWEN, F.L., and McIVER, S.
Department of Environmental Biology
University of Guelph
Guelph, Ontario N1G 2W1

TITLE: PESTICIDES FOR ONION MAGGOT CONTROL

MATERIALS: Each of the following treatments was applied at two different rates of application, DYFONATE(R) 5 G (fonofos) + thiram 10 G, LORSBAN(R) 15 G (chlorpyrifos), TRIGARD 3 G (cyromazine), LANCE 15 G (cloethocarb), BROOT 15 GX, (trimethocarb), DYFONATE ST (fonofos 431 g/L), PRO GRO(R) (carbathiin 30%, thiram 50%).

METHODS: The tests were done at the Holland Marsh on muck soil. The experimental plot was arranged in a randomized complete block design with four replicates. Each plot had two rows 6 metres long with 40 cm between the rows. In addition to the granular pesticides applied with the seed, all seed was treated by shaking it with a dust formulation of Pro Gro at 25 g Pro Gro per 1 kg seed. The granular formulations were applied in the furrow at planting time by adding them with the seed on a V-belt planter. Estimates of the effectiveness of treatments were made as follows: one row of each plot was examined May 27, June 1, 4, 8, 11, 15, 18, 23, 25, 29, July 2, 7 and 14 for onion maggot damage. On each date plants wilting from onion maggot were removed. On July 14, the remaining plants were pulled and examined for onion maggots. The second row was harvested on September 9 for yield.

RESULTS: Data are presented in Table 1.

CONCLUSIONS: At the higher rate DYFONATE, LORSBAN and TRIGARD controlled the onion maggot infestation (38.4%). DYFONATE, seed treated, had a low initial stand count and 13-16% onion maggot damage. LANCE and BROOT were not satisfactory in controlling the onion maggot.

Yields were reduced by onion maggot damage.

TABLE 1. Initial stand, % maggot damage and yield following the indicated treatment at seeding[1].

Treatments	Rate kg ai/ha	Mean based on 4 replicates: Initial plant count[2]	% Maggot damage[3]	Yield kg/ha x 10^3 [4]
DYFONATE + thiram (5 + 10)	1.1	262	15.2c[7]	65bcd
	2.2	288	7.5ab	73bcd
LORSBAN 15 G	1.1	255	19.8c	73bcd
	2.2	289	6.1a	75cd
TRIGARD 3 G	0.6	281	7.9ab	72bcd
	1.2	262	5.1a	85d
LANCE 15 G	1.5	291	36.0de	54bc
	3.0	287	32.8de	52bc
BROOT 15 GX	1.4	238	39.5e	28a
	2.8	229	29.5d	32a
DYFONATE ST[5]	0.015[6]	233	16.3c	61bcd
	0.02	206	15.3c	60bcd
	0.025	204	13.3bc	60bcd
Check		263	38.4e	53a

1. Seed treated with Pro Gro (carbathiin 30%, thiram 50%). Based on 4 replicates. Seeded May 6, 1987.
2. Per 6 metres of row May 25; mean of 4 replicates.
3. Accumulative counts May 27, June 1, 4, 8, 11, 15, 18, 23, 25, 29, July 2, 7 and 14. Based on 6 metres, 4 replicates.
4. Based on 6 metres, 4 replicates, September 9.
5. ST = seed treated (Chipman Inc.).
6. Kg ai/kg seed.
7. Means followed by the same letter are not significantly different (P=0.05) according to Duncan's Multiple Range Test.

CROP: Onions, var. Rocket

PEST: Onion maggot, Delia antiqua (Meig.)

TITLE: PESTICIDES FOR ONION MAGGOT CONTROL - PRECISION SEEDING

NAME AND AGENCY:
RITCEY, G., McEWEN, F.L., and McIVER, S.
Department of Environmental Biology
University of Guelph
Guelph, Ontario N1G 2W1
VALK, M. and KNIBBE, E.
Ontario Ministry of Agriculture and Food
Muck Research Station, R.R. 1
Kettleby, Ontario L0G 1J0

MATERIALS: Each of the following treatments was applied at 3 different rates of application, DYFONATE(R) 5 G (fonofos) + thiram 10 G LORSBAN(R) 15 G (chlorpyrifos), TRIGARD 3 G (cyromazine), LANCE 15 G (cloethocarb), PRO GRO(R) (carbathiin 30%, thiram 50%).

METHODS: The tests were done at the Holland Marsh on muck soil. The experimental plot was arranged in a randomized complete block design with four replicates. Each replicate row was 24 metres long. Seed was custom-coated PRO GRO-treated seed (Asgrow Seed Company). The granular formulations were applied by using a Stan-Hay precision seeder in a bed of four double rows. The width of the bed was 1.7 metres. Each bed had three different rates of application of a granular treatment and an untreated row. Initial stand was based on the number of plants in two, two-metre lengths in each row. The same row segments were checked on May 27, June 1, 4, 11, 15, 18, 23, 25, 29, July 2, 7 and 14 and damaged plants were counted and removed. On July 14, all plants were pulled from the same two, two-metre segments in each row and plants examined for maggot damage. On June 10, the average height of plants was estimated in 2 metres of each row to determine any growth effects due to toxicants. On September 9, five metres of onions of each row were harvested for yield.

RESULTS: Data are presented in Table 1.

CONCLUSIONS: DYFONATE and LORSBAN were effective in controlling the high infestation (34+%) of the onion maggot. Similar control was obtained with the unregistered insecticide, TRIGARD. LANCE was not satisfactory.

At the higher rates DYFONATE produced some phytotoxicity as shown by reduced plant height. In comparison to the untreated plots yields increased with LORSBAN, TRIGARD, and the lower rates of DYFONATE.

TABLE 1. Initial onion stand, % maggot damage and yield following the indicated treatment at seeding[1].

		Mean based on 4 replicates			
Treatments	Rate kg ai/ha[2]	Initial plant count[3]	Height cm[4]	% Maggot damage[5]	Yield kg/ha x 10^3 [6]
DYFONATE + thiram	0	151	16	29.6cd[7]	58.3ab
(5 + 10)	1.1	255	15	8.4ab	89.3g
	2.2	152	13	2.6a	74.0c-f
	4.5	149	11	1.7a	64.7a-e
LORSBAN 15 G	0	178	16	42.2d	60.0a-c
	1.1	198	15	6.4a	79.3d-g
	2.2	169	15	1.5a	81.3fg
	4.5	160	14	2.0a	86.7fg
TRIGARD 3 G	0	168	15	26.0c	63.5a-d
	0.4	174	15	10.4ab	77.2d-f
	0.6	157	15	1.8a	71.7b-f
	1.2	167	15	2.7a	75.1d-f
LANCE 15 G	0	151	15	39.6d	50.0a
	1.5	177	15	20.4b	59.0a-c
	3.0	155	15	26.2c	56.2ab

1. Seeded May 1, 1987.
2. Based on insecticides.
3. Counted May 25. Based on 4 metres of row, 4 replicates.
4. Measured June 10.
5. Accumulative counts May 27, June 1, 4, 8, 11, 15, 18, 23, 25, 29, July 2, 7, and 14.
6. Based on 5 metres, 4 replications, September 9.
7. Means followed by the same letter are not significantly different (P=0.05) according to Duncan's Multiple Range Test.

CROP: Onions, var. Taurus

PEST: Onion maggot, Delia antiqua (Meigen)

TITLE: EVALUATION OF GRANULAR INSECTICIDES FOR ONION MAGGOT CONTROL

NAME AND AGENCY:
VERNON, R.S. and J.R. MACKENZIE
Agriculture Canada, Research Station
Vancouver, British Columbia V6T 1X2

MATERIALS: BIRLANE 10G (chlorfenvinphos); COUNTER 15G (terbufos); DASANIT 15G (fensulfothion); DIAZINON 5G (diazinon); DYFONATE 10G (fonofos); FURADAN 10G (carbofuran); LORSBAN 15G (chlorpyrifos); PRO GRO (carbathiin 30%, thiram 50%).

METHODS: The experiment was set up on 27 and 28 April, 1987 in a muck soil farm near Cloverdale in Surrey, B.C. Treatment plots were arranged in a randomized complete block design with 4 replicated blocks. Plots were 1.8 m wide by 4 m long beds, containing 4 rows of onions spaced 45 cm apart. A 2 m strip between end-to-end plots was left unseeded. The seed was pelleted with PRO GRO in the pellet material. The granular insecticides were applied at seeding into the open furrow alongside the seed with a custom-built, geared applicator attached to a hand-pushed Stanhay precision seeder. The granule delivery tube was positioned directly behind the shoe. Treatments were tested at 2 rates/bed, or two adjacent rows/rate (see Table). Treatment efficacy was assessed by counting the number of maggot damaged seedlings along the entire length of each row at regular intervals (see Table). For analysis, the arcsin square root of the ratio of the cumulative total of damaged seedlings at each assessment date, to the initial count of healthy seedlings was used. Soil moisture in the experimental area was determined on 28, 30 April; 7, 15 May; and 1, 8, 16, 25 June.

RESULTS: The results are summarized in the Table. Soil moisture (w/w) ranged from 42-54% with an average of 48% during the study.

CONCLUSIONS: Although not significant, DYFONATE and DASANIT (at the higher rate) provided the greatest reduction in maggot damage 49 days post-seeding. Plots which received the lower rate of DYFONATE also had less damage at 42 days post-seeding. The higher rates of LORSBAN and COUNTER provided acceptable control up to 35 days post-seeding, whereas FURADAN, at both rates tested failed to provide acceptable control at 35 days.

		AVERAGE CUMULATIVE INDEX OF DAMAGED SEEDLINGS[1]						
TREATMENT	RATE (g ai/10 m)	17[2]	21	28	35	42	49	62
BIRLANE	0.25	0 NS[3]	0.2 a[4]	1.5 abc	2.8 abc	5.0 abcde	7.4 abcd	11.9 NS
	0.50	0	0 a	1.7 abc	3.3 abc	6.5 abcde	9.0 abcd	18.8
COUNTER	0.60	0	0.1 a	1.5 abc	2.8 abc	5.0 abcde	7.5 abcd	11.3
	1.00	0.1	0.1 a	0.9 ab	1.6 ab	3.6 abcd	7.1 abcd	18.2
DASANIT	0.30	0.2	0.9 ab	1.5 abc	3.1 abc	4.1 abcd	6.9 abcd	19.0
	0.60	0	0 a	0.6 ab	1.2 ab	1.2 ab	2.1 ab	8.4
DIAZINON	0.60	0.4	0.5 ab	1.6 abc	3.7 abc	6.5 abcde	10.9 abcd	17.3
	1.20	0	0 a	1.9 abc	4.5 abc	6.1 abcde	8.9 abcd	12.6
DYFONATE	0.30	0	0 a	0.1 a	0.8 ab	1.7 abc	3.2 abc	14.2
	0.50	0	0 a	0.1 a	0.1 a	0.3 a	1.6 a	9.0
FURADAN	0.40	1.0	4.0 ab	7.1 bc	10.2 bc	13.9 cde	18.9 bcd	26.8
	0.60	0.4	1.3 ab	7.5 bc	14.6 c	20.4 e	28.4 d	41.4
LORSBAN	0.50	0	0.6 ab	2.2 abc	4.5 abc	10.1 bcde	16.1 abcd	28.5
	1.30	0.1	0.2 a	0.2 a	0.8 ab	2.0 abc	3.6 abc	8.3
Control	-	1.2	6.3 b	10.7 c	14.5 c	16.3 de	21.5 cd	34.5
	-	0.4	1.7 ab	4.6 abc	5.9 abc	7.3 abcde	17.0 abcd	31.7

[1]Values in the Table are back transformed means of treatments converted to a percent damage index.
[2]Days after seeding.
[3]NS:Values were not significantly different at the 5% level according to Duncan's multiple range test.
[4]Numbers followed by the same letter are not significantly different at the 5% level according to Duncan's multiple range test.

CROP: Onions, var. Taurus

PEST: Onion maggot, Delia antiqua (Meigen)

TITLE: EVALUATION OF SOIL DRENCHES FOR ONION MAGGOT CONTROL - STUDY I, IRRIGATED SOIL.

NAME AND AGENCY:
VERNON, R.S. AND J.R. MACKENZIE
Agriculture Canada, Research Station
Vancouver, British Columbia V6T 1X2

MATERIALS: BIRLANE 40EC (chlorfenvinphos); DASANIT SC (fensulfothion); DECIS 5.0F (deltamethrin); DIAZINON 50EC (diazinon); DYFONATE MS (fonofos); FURADAN 4.8F (carbofuran); LORSBAN 4E (chlorpyrifos); PRO GRO (carbathiin 30%, thiram 50%); PARATHION 8EC.

METHODS: The experiment was seeded on 23 April, 1987 in a muck soil on a farm near Cloverdale in Surrey, B.C. Treatment plots were arranged in a randomized complete block design with 4 replicated blocks. Plots were beds 1.8 m wide and 2.5 m long containing 4 rows of onions spaced 45 cm apart. A 2 m strip between end-to-end plots was left unseeded. The seed was pelleted with PRO GRO in the pellet material. To prevent onion flies from laying eggs in the plots before treatment application, the entire experiment was covered with a gauze crop cover (AGRONET®) on 27 April. On 6 May, the crop cover was removed and the next morning, drenches were applied in a 10 cm wide band along the row (see Table for rates). Before drenching, plots were irrigated to saturation with hand held watering cans. Average soil moisture within the experimental area was determined at 7-10 day intervals during the study. Treatments were applied with a hand pushed, CO_2 pressurized boom sprayer fitted with 4, type 4003 nozzles, at 275 kPa to deliver 1,100 L water/ha. Treatment efficacy was assessed at regular intervals by counting the number of healthy and maggot damaged seedlings along the entire length of each row (see Table). Maggot damaged seedlings were dissected in the field and the number of live maggots counted. The seedling data were subject to an analysis of variance and treatments were compared by Duncan's multiple range test. For analysis, the arcsin square root of the ratio of the cumulative total of damaged seedlings at each assessment date, to the initial count of healthy seedlings was used.

RESULTS: The results are summarized in the table. Soil moisture (w/w) ranged from 60% on 7 May to 42% by 25 June with a mean of 50% throughout the study.

CONCLUSIONS: Significant differences in maggot damage occurring between replicates was observed in this study. Although significant differences were not observed between treatments and check plots, some treatments did appear to offer some degree of seedling protection. In particular, DASANIT, FURADAN and BIRLANE had fewer damaged seedlings overall 25 days after drenching in pre-irrigated soil. Numbers of live maggots counted from damaged seedlings were consistently lower in the DASANIT and BIRLANE treated plots.

TREATMENT	APPLICATION RATE (g ai/10 m)	CUMULATIVE TOTAL OF DAMAGED SEEDLINGS (DS) OR LIVE MAGGOTS (LM)							
		1[1]		4-25		4-39		4-53	
		DS	LM	DS	LM	DS	LM	DS	LM
BIRLANE	1.8	4 NS[2]	0[3]	11 NS	2	15 NS	4	19 NS	8
DASANIT	1.9	1	0	7	4	13	6	21	10
DECIS	0.01	1	0	15	4	26	6	45	20
DIAZINON	0.95	0	0	15	11	37	20	54	31
DYFONATE	1.25	6	0	20	14	26	14	38	21
FURADAN	1.13	1	0	8	6	15	11	30	18
LORSBAN	1.35	8	0	19	7	26	10	38	16
LORSBAN	0.48	7	0	20	8	33	14	42	19
PARATHION	1.02	2	0	37	21	53	31	65	35
Control	-	9	4	32	9	54	18	75	32

[1]Days after drenching.
[2]NS: Values not significantly different at the 5% level according to Duncan's multiple range test.
[3]Statistical analysis not conducted.

CROP: Onions, var. Taurus

PEST: Onion maggot, Delia antiqua (Meigen)

TITLE: EVALUATION OF SOIL DRENCHES FOR ONION MAGGOT CONTROL - STUDY II, NON-IRRIGATED SOIL.

MATERIALS: BIRLANE 40EC (chlorfenvinphos); DASANIT SC (fensulfothion); DECIS 5.0F (deltamethrin); DIAZINON 50EC (diazinon); DYFONATE MS (fonofos); FURADAN 4.8F (carbofuran); LORSBAN 4E (chlorpyrifos); PRO GRO (carbathiin 30%, thiram 50%); PARATHION 8EC.

METHODS: The experiment was seeded on 23 April, 1987 in a muck soil on a farm near Cloverdale in Surrey, B.C. Treatment plots were arranged in a randomized complete block design with 4 replicated blocks. Plots were beds 1.8 m wide and 2.5 m long containing 4 rows spaced 45 cm apart. A 2 m strip between end-to-end plots was left unseeded. The seed was pelleted with PRO GRO in the pellet material. To prevent onion flies from laying eggs in the plots before treatment application, the entire experiment was covered with a gauze crop cover (AGRONET®) on 27 April. On 6 May, the crop cover was removed and the next morning, drenches were applied in a 10 cm wide band along the row (see Table for rates). The average soil moisture within the experimental field was determined at 7-10 day intervals during the study. Treatments were applied with a hand pushed, CO_2 pressurized boom sprayer fitted with 4, type 4003 nozzles, at 275 kPa to deliver 1,100 L water/ha. Treatment efficacy was assessed at regular intervals by counting the number of healthy and maggot damaged seedlings along the entire length of each row (see Table). Maggot damaged seedlings were dissected in the field and the number of live maggots counted. The data were subject to an analysis of variance and treatments were compared by Duncan's multiple range test. For analysis, the arcsin square root of the ratio of the cumulative total of damaged seedlings at each assessment date, to the initial count of healthy seedlings was used.

NAME AND AGENCY:
VERNON, R.S. AND J.R. MACKENZIE
Agriculture Canada, Research Station
Vancouver, British Columbia V6T 1X2

RESULTS: The results are summarized in the table. Soil moisture (w/w) ranged from 54% on 15 May to 42% on 25 June with a mean of 49% during the study.

CONCLUSIONS: Although significant differences were not observed between treatments and check plots, certain treatments did appear to offer some degree of seedling protection. In particular, DASANIT and FURADAN had fewer damaged seedlings overall in non-irrigated soil. BIRLANE and DYFONATE also provided noticeable control. Numbers of live maggots counted from damaged seedlings were consistently lower in the DASANIT and FURADAN treated plots.

TREATMENT	APPLICATION RATE (g ai/10 m)	CUMULATIVE TOTAL OF DAMAGED SEEDLINGS (DS) OR LIVE MAGGOTS (LM)							
		1[1]		4-25		4-39		4-53	
		DS	LM[2]	DS	LM	DS	LM	DS	LM
BIRLANE	1.8	4 NS[3]	0	14 NS	11	17 NS	11	22 NS	15
DASANIT	1.9	0	0	8	6	8	6	9	6
DECIS	0.01	7	0	29	14	40	22	63	31
DIAZINON	0.95	2	0	9	5	29	11	52	24
DYFONATE	1.25	5	0	14	5	15	5	22	11
FURADAN	1.13	7	0	12	4	12	4	15	7
LORSBAN	1.35	3	0	18	12	36	20	45	26
LORSBAN	0.48	4	0	19	11	21	12	32	18
PARATHION	1.02	2	0	14	8	43	23	54	29
CONTROL	-	8	3	40	16	73	36	84	45

[1]Days after drenching.
[2]Statistical analysis not conducted.
[3]NS: Values not significantly different at the 5% level according to Duncan's multiple range test.

CROP: Field peas cv. Century

PEST: Pea aphid, Acyrthosiphon pisum (Harris)

TITLE: EVALUATION OF KARATE FOR CONTROL OF PEA APHIDS, 1987

MATERIALS: KARATE EC (PP 321 100 g/L), KARATE FL (PP 321 87 g/L), PIRIMOR 50 WP (pirimicarb 500 g/kg).

METHODS: Trial was conducted in a commercial field of Century peas. Plots were 3m x 6m and arranged in a completely randomized block design. Plots were sprayed on August 4 using a CO_2 hand held sprayer delivering 112 L/ha at 275 kPa through SS8001 TeeJet nozzles. Counts were taken by holding a white sheet under a handful of plants and shaking vigourously. This was done at 10 random stops throughout each plot.
Location: Dugald, Manitoba

NAME AND AGENCY:

MOONS, B.
Chipman, A Business Unit of C-I-L Inc.
86-1313 Border Street
Winnipeg, Manitoba
R3H 0X4

RESULTS: The results are summarized in the table below.

CONCLUSIONS: At 3 and 7 DAT, all KARATE treatments provided a significantly reduced number of pea aphids on the crop compared to PIRIMOR and the untreated check.

TREATMENT	RATE (kg ai/ha)	NUMBER OF PEA APHIDS					
		Prespray	1 DAT		3 DAT	7 DAT	
KARATE EC	0.0075	24.3 a[1]	2.0 ab	(92.4)[2]	2.0 a (93.2)	1.0 a	(95.7)
KARATE EC	0.0100	25.0 a	0.8 a	(97.2)	1.5 a (95.0)	0.8 a	(96.8)
KARATE FL	0.0100	23.0 a	3.8 bc	(84.9)	2.5 a (90.9)	1.0 a	(95.5)
PIRIMOR 50 WP	0.0750	23.8 a	7.5 c	(70.8)	9.8 b (65.8)	5.8 b	(74.5)
Check	-	25.0 a	27.0 d		30.0 c	23.8 c	

1. Treatment means in the same column followed by the same letter are not significantly different at the 5% level (t-test).
2. Percent mortality adjusted using Abbott's formula.

CROP: Field peas cv. Century

PEST: Pea aphid, Acyrthosiphon pisum (Harris)

TITLE: KARATE FOR CONTROL OF PEA APHIDS, 1987

MATERIALS: KARATE EC (PP 321 100 g/L), KARATE FL (PP 321 87 g/L), PIRIMOR 50 WP (pirimicarb 500 g/kg).

METHODS: Trial was conducted in a commercial field of Century peas. Plots were 3m x 6m and arranged in a completely randomized block design. Plots were sprayed on August 4 using a CO_2 hand held sprayer delivering 112 L/ha at 275 kPa through SS8001 TeeJet nozzles. Counts were taken by holding a white sheet under a handful of plants and shaking vigourously. This was done at 10 random stops throughout each plot.
Location: Dugald, Manitoba

NAME AND AGENCY:

MOONS, B.
Chipman, A Business Unit of C-I-L Inc.
86-1313 Border Street
Winnipeg, Manitoba
R3H 0X4

RESULTS: The results are summarized in the table below.

CONCLUSIONS: At all assessment dates, all KARATE treatments provided a significantly reduced number of pea aphids on the crop compared to the untreated check.

TREATMENT	RATE (kg ai/ha)	NUMBER OF PEA APHIDS			
		Prespray	1 DAT	3 DAT	7 DAT
KARATE EC	0.0075	25.3 a	2.5 ab[1] (89.8)[2]	2.0 b (93.5)	1.8 b (93.6)
KARATE EC	0.0100	22.5 a	1.3 a (97.6)	0.5 a (98.2)	0.5 a (97.9)
KARATE FL	0.0100	22.8 a	4.8 bc (78.4)	0.8 a (97.3)	0.5 a (97.9)
PIRIMOR 50 WP	0.0750	22.0 a	11.0 cd (43.2)	9.0 c (63.1)	7.0 c (67.4)
Check	-	24.0 a	23.3 d	29.3 d	25.8 d

1. Treatment means in the same column followed by the same letter are not significantly different at the 5% level (t-test).
2. Percent mortality adjusted using Abbott's formula.

CROP: Field peas, cv. Princess

PEST: Pea aphid, Acyrthosiphon pisum (Harris)

TITLE: KARATE RATES AND FORMULATION EFFECTS ON PEA APHIDS, 1987

MATERIALS: KARATE FL (87 g/L PP 321), KARATE EC (100 g/L PP 321).

METHODS: Princess peas were seeded near Richard, Saskatchewan into clay loam on April 27, 1987. Seeding depth was 3 cm and row spacing was 18 cm. All chemical treatments were applied on July 23, 1987 at 12:00 hours, air temperature was 22°C and wind was 7 gusting to 10 km/hr. The chemicals were applied in 110 L/ha of water using a hand-held boom sprayer equipped with six 8001 SS TeeJet nozzles spaced 50 cm and set 50 cm above the crop. The crop at application was in bloom and podding. Yields were taken using a small plot combine harvesting a 7.8 m^2 portion of each plot. Experimental design was a randomized complete block with 4 replications.
Location: Richard, Saskatchewan

NAME AND AGENCY:

PARTYKA, E.F.
Chipman, A Business Unit of C-I-L Inc.
2108C St. George Avenue
Saskatoon, Saskatchewan
S7M 0K7

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All chemical treatments significantly reduced aphid populations.

Treatment	Rate kg ai/ha	MEAN COUNT OF APHIDS PER PLANT[1]			
		Prespray	1 day	3 days	7 days
KARATE EC	0.0075	23.3 a[1]	1.6 b (78.3)[2]	0.0 a (100)	0.2 a (96.0)
KARATE EC	0.0100	27.0 a	1.3 ab (84.8)	0.0 a (100)	0.4 a (93.1)
KARATE FL	0.0100	28.3 a	0.3 a (96.6)	0.0 a (100)	0.2 a (96.7)
Untreated	-	38.3 a	12.2 c	7.7 b	8.3 b

1. Treatment means in the same column followed by the same letter are not significantly different at the 5% level (t-test).
2. Percent mortality adjusted using Abbott's formula.

CROP: Potato, cv. Russet Burbank

PEST: Colorado potato beetle, Leptinotarsa decemlineata (Say)

TITLE: CONTROL OF THE COLORADO POTATO BEETLE

MATERIALS: M-ONE 4.5% (Bacillus thuringiensis var. san diego), KELTHANE 187.5 g/L EC (dicofol), BELMARK 300 EC (fenvalerate)

METHODS: Plots consisted of 4 rows 7.3 m in length with rows 0.91 m apart. Each treatment was replicated four times in a completely randomized block design. Potatoes were planted May 13 at 40 cm spacing. A weed control spray of linuron at 1.8 kg/ha was applied on June 2. For treatment dates, please see Table 1. Counts of Colorado potato beetles were taken on 5 whole plants/plot at first and from 5 stems/plot from July 6 onward. Defoliation was evaluated visually in each plot. The field was topkilled on September 2 and the two center rows were harvested to determine the marketable yield.

NAME AND AGENCY:
BOITEAU, G., and DUNPHY, J.C.
Agriculture Canada, Research Station
Fredericton, N.B.

RESULTS: Results are summarized in the Table.

CONCLUSIONS: Plots were exposed to severe insect pressure: unprotected plots were defoliated down to stems by July 13. The foliage of plots receiving repeated applications of BELMARK was protected against the larvae but not against the massive emergence of adults, at the beginning of August, from surrounding plots unsuccessfully protected. This interplot effect reduced the yield in plots of all successful treatments. The higher rate of M-ONE tested provided the next best yield: 50% and 85% of the best yield (Belmark) in weight and in number of tubers respectively. The significant effect of the high rate of M-ONE on the number of larvae is visible on the July 6 and 13 counts and defoliation ratings. The first spray was applied 6 days after egg hatching was first observed. An earlier date might have been more effective. Also, because of the large numbers of beetles, three applications of M-ONE might have ensured better foliage protection. Results are very encouraging for the control of moderate beetle populations. Insecticidal properties were recently attributed to KELTHANE (R.K. Jansson, pers. comm.). Our tests indicate that field control of the beetle can be obtained only with repeated applications of a high rate of KELTHANE. This requirement and concerns surrounding the toxicity of the product for wildlife limit severely its potential for potato beetle control.

Table 1. Mean number of Colorado potato beetle larvae per 5 stems and defoliation in potato plots

Treatment			Colorado potato beetle larvae and defoliation index[1]						Total yield	
Product	Rate	Date	6/24	6/29	7/2	7/6	7/13	8/4	Weight t/ha	Number 1000_s/ha
M-ONE	4.6 L/ha	6/29;7/8	-- (-)	27.25a (3)	36.13a (3)	63.00b (3)	131.25a (5)	1.50a (7)	3.18cd	49.90c
M-ONE	6.9 L/ha	6/29;7/8	-- (-)	33.69a (3)	31.38a (3)	26.50bc (3)	63.00bc (4)	2.75a (6)	7.32b	111.38ab
KELTHANE	1.6 L/ha	7/2	-- (-)	-- (-)	-- (-)	62.75b (4)	117.75a (5.5)	0.75a (8)	1.54d	33.08cd
KELTHANE	1.6 L/ha	6/25;7/2	11.13a[2] (3)	17.63a (3)	-- (-)	66.25b (3)	108.00a (6.0)	1.00a (8)	1.79d	39.80cd
KELTHANE	2.4 L/ha	7/2	-- (-)	-- (-)	-- (-)	71.50b (3)	101.75a (5.5)	1.50a (8)	1.97d	36.63cd
KELTHANE	2.4 L/ha	6/25;7/2	12.31a (3)	17.25a (3)	-- (-)	33.50bc (3)	93.50a (5.5)	1.00a (7)	5.61bc	91.94b
Control	--	--	5.13a (3)	24.06a (3)	53.25a (3)	142.75a (4)	96.75a (7)	-- (8)	0.43d	10.47d
Control (BELMARK)[3]	0.1 L/ha	6/25;7/2; 7/8;7/16	8.94a (2)	0.19b (2)	-- (-)	3.50c (2)	4.00c (3)	2.50a (4)	14.47a	129.69a

[1]Defoliation index: mean on a scale of 0 to 8--0 to 100% defoliation.
[2]Values followed by the same letter in a column are not significantly different (P > 0.05) according to Duncan's Multiple Range Test.
[3]All plots received BELMARK sprays on July 29, August 5, 12, 19 and 26 to minimize interplot movement of adults.

CULTURE: Pomme de terre, cultivar Superior

RAVAGEUR: Doryphore de la pomme de terre, Leptinotarsa decemlineata (Say).

TITRE: ESSAI D'EFFICACITÉ DE LA DELTAMETHRINE UTILISÉE A DIFFÉRENTES PRESSIONS ET A VOLUME CONSTANT.

PRODUITS: DECIS 2,5 EC (deltaméthrine), utilisé à la dose de 5,6 g i.a./ha.

MÉTHODES: L'essai a été effectué selon un dispositif de blocs casualisés avec 4 répétitions, constitués de parcelles de 10 m de longueur avec 4 rangs espacés de 0,91 m. Les pommes de terre ont été plantées le 20 mai à 25 cm d'espacement. Les insectides ont été appliqués le 2 et le 14 juillet au moyen d'un pulvérisateur monté sur tracteur (pressions variables (tableau des résultats), volume: 500 L/ha, pastilles: "Tee jet" No D4-25). L'évaluation des densités du doryphore (larves, adultes et masses d'oeufs) a été faite avant et après chacun des traitements à partir de 10 plants/parcelle répartis au hasard dans les 2 rangées du centre. Le dommage aux plants a été évalué visuellement pour chacune des parcelles. Le défanage à l'aide du Réglone a eu lieu le 7 août. Les deux rangées du centre ont été récoltées le 27 août afin de déterminer le rendement total en tubercules.

NOM ET ORGANISME:
DUCHESNE, R.-M.
Service de recherche en phytotechnie de Québec
Ministère de l'Agriculture, des Pêcheries et de l'Alimentation
2700, rue Einstein
Sainte-Foy, Québec G1P 3W8

RÉSULTATS: Voir tableau 1 ci-dessous.

CONCLUSION: Pour l'ensemble des résultats obtenus et des différentes pressions utilisées il est évident que DECIS a donné une excellente protection. Les rendements sont très élevés, le dommage est faible et les densités ont été maintenues à des niveaux acceptables économiquement. Avec le même cultivar et des densités sensiblement comparables, des parcelles témoins d'un projet à proximité de celui-ci ont donné en moyenne un indice de défoliation avant la récolte de 7,5 et un rendement de 28,84 kg. En regard de l'objectif visé par cet essai, il n'y a pas de différences significatives entre les résultats pour le rendement et les densités évaluées pour chacune des pressions utilisées. Il y a toutefois des différences significatives pour l'évaluation visuelle du dommage le 14 juillet, le 17 juillet et le 6 août. L'interprétation des résultats nous oblige à une certaine prudence. Cependant, il semble y avoir une meilleure performance de DECIS a de basses pressions. A de plus hautes pressions, comme 1750 k Pa, il y a une très bonne pénétration du feuillage mais aussi une plus grande dérive du produit. Ces résultats devraient être complétés par des vérifications en champs. De plus, ils ne peuvent pas être totalement appliqués à tous les insecticides chimiques utilisés contre le doryphore et encore moins avec des produits biologiques, comme B.t. Enfin, il est possible que les résultats soient différents selon les volumes de bouillie utilisés.

Tableau 1. Population du doryphore (nombre moyen de larves/10 plants), dommage aux plants et rendement total en tubercules, saison 1987.

Traitement	Pression (k Pa)	Population larvaire						Dommage[2]					Rendement
		juillet						juillet				août	
		2[1]	7	10	14[1]	17	30	7	14	17	27	6	(kg/parcelle)
1	500	221 a[3]	18 a	53 a	147 a	37 a	28 a	1,2 a	2,7 ab	2,2 b	3,0 a	3,0 b	62,77 a
2	1000	180 a	18 a	52 a	144 a	49 a	30 a	1,2 a	2,5 b	2,5 ab	3,0 a	2,7 b	62,18 a
3	1500	207 a	25 a	54 a	135 a	50 a	25 a	1,5 a	3,0 ab	3,0 ab	3,0 a	3,0 b	60,30 a
4	1750	129 a	33 a	89 a	219 a	83 a	28 a	1,5 a	3,5 a	3,2 a	3,2 a	3,7 a	58,33 a

1 Date des traitements et stades de l'insecte= 2 juillet: 87,5% L1+2, 12,5% L3+4, 0,6 adultes/plant 0,8 masses d'oeufs/plant; 14 juillet: 20,5% L1+2, 79,5% L3+4, 0,3 adultes/plant, 0,2 masses d'oeufs/plant.

2 Évaluation visuelle: Index de défoliation de 0 à 8 (0 à 100% de défoliation).

3 Les résultats suivis d'une même lettre ne sont pas significativement différents à un seuil de 0,05 (Duncan's Multiple Range Test).

N.B. Projet réalisé avec la collaboration de Claire Chouinard, technicienne.

CULTURE: Pomme de terre, cultivar Atlantic

RAVAGEUR: Doryphore de la pomme de terre, Leptinotarsa decemlineata (Say).

TITRE: ESSAI DE BACILLUS THURINGIENSIS, VOLET 5.

PRODUITS: Belmark 300 EC (fenvalérate), EG 2158 WP (endotoxine-delta de Bacillus thuringiensis, var. non déterminé, à 10% i.a.), PLYAC (adhésif utilisé avec B.t., 5 ml/3,8 l de bouillie).

MÉTHODES: L'essai a été effectué selon un dispositif de blocs casualisés avec 4 répétitions, constitués de parcelles de 7,5 m de longueur avec 4 rangs espacés de 0,91 m. Les pommes de terre ont été plantées le 14 mai à 25 cm d'espacement. Les insectides ont été appliqués le 30 juin, le 6 et le 16 juillet au moyen d'un pulvérisateur monté sur tracteur (pression: 1723,7 k Pa, volume: 1000 L/ha). L'évaluation des densités du doryphore (larves, adultes et masses d'oeufs) a été faite avant et après chacun des traitements à partir de 5 plants/parcelle répartis au hasard dans les 2 rangées du centre. Le dommage aux plants a été évalué visuellement pour chacune des parcelles. Le défanage à l'aide du Réglone a eu lieu le 12 août. Les deux rangées du centre ont été récoltées le 28 août afin de déterminer le rendement total en tubercules.

NOM ET ORGANISME:
DUCHESNE, R.-M.
Service de recherche en phytotechnie de Québec
Ministère de l'Agriculture, des Pêcheries et de l'Alimentation
2700, rue Einstein
Sainte-Foy, Québec G1P 3W8

RÉSULTATS: Voir tableau 1 ci-dessous.

CONCLUSION: De cet essai, considéré comme préliminaire avec une autre variété de Bacillus thuringiensis, il est possible et intéressant de dégager certaines observations même si les résultats ne sont pas totalement significatifs. Comparativement a BELMARK, il n'y a pas eu de baisse importante et rapide des densités. Cette situation est expliquée par une faible rémanence du produit et une toxicité qui affecte surtout le premier stade larvaire du doryphore. Malgré une certaine stabilité des densités, l'impact sur le feuillage demeure tout de même inférieure à celui observée pour le témoin. Pour les larves affectées par B.t., même si la mortalité est lente à se manifester, il y a ralentissement et arrêt de la consommation. Considérant que le premier traitement a été fait trop tardivement, en présence de stades moins susceptibles à B.t. et que les doses utilisées sont probablement trop faible, les résultats demeurent dans l'ensemble satisfaisants et aussi très encourageants. La différence dans les rendements obtenus avec BELMARK et B.t. (226 g i.a./ha) reste faible. Les chances d'augmenter l'efficacité de B.t. sont probablement très grandes. Comme avec d'autres variétés de B.t. la performance contre le doryphore sera fonction des doses utilisées, de la stabilité de la formulation, d'une meilleure rémanence et d'une utilisation stratégique.

Tableau 1. Population du doryphore (nombre moyen de larves/5 plants), dommage aux plants et rendement total en tubercules, saison 1987.

Traitement[1] Insecticide	Dose (g i.a./ha)	Population larvaire juin 29	Population larvaire juillet 6	Population larvaire juillet 9	Population larvaire juillet 14	Population larvaire juillet 21	Dommage[2] juillet 6	Dommage[2] juillet 14	Dommage[2] juillet 27	Dommage[2] Août 6	Rendement (kg/parcelle)
1 EG2158	226	68 a[3]	132 ab	116 b	117 a	72 a	2,0 ab	4,5 a	4,0 b	4,5 c	37,33 b
2 EG2158	113	84 a	175 a	134 b	113 a	62 a	2,5 a	4,5 a	4,0 b	5,5 b	31,76 b
3 BELMARK	37,5	91 a	42 b	34 c	36 b	11 b	1,5 b	2,2 b	2,5 c	2,7 d	45,93 a
4 Témoin		72 a	152 a	219 a	113 a	49 a	2,2 ab	5,2 a	5,0 a	6,7 a	29,44 b

1 Dates des traitements et stades de l'insecte. Les traitements ont été faits le 30 juin, le 6 et le 16 juillet. Stades de l'insecte= 30 juin: 1,1 masses d'oeufs/plant, 0,3 adultes/plant, 77,3% L1+2, 22,7% L3+4.

2 Évaluation visuelle: Index de défoliation de 0 à 8 (0 a 100% de défoliation).

3 Les résultats suivis d'une même lettre ne sont pas significativement différents à un seuil de 0,05 (Duncan's Multiple Range Test).

N.B. Projet réalisé avec la collaboration de Claire Chouinard, technicienne.

CULTURE: Pomme de terre, cultivar Atlantic

RAVAGEUR: Doryphore de la pomme de terre, Leptinotarsa decemlineata (Say).

TITRE: ESSAI DE BACILLUS THURINGIENSIS VAR. SAN DIEGO AVEC UN INSECTICIDE CHIMIQUE, VOLET 4.

PRODUITS: Belmark 300 EC (fenvalérate), M-ONE INSECTICIDE LI (endotoxine-delta de Bacillus thuringiensis, var. san diégo, à 4,5% i.a.).

MÉTHODES: L'essai a été effectué selon un dispositif de blocs casualisés avec 4 répétitions, constitués de parcelles de 5 m de longueur avec 4 rangs espacés de 0,91 m. Les pommes de terre ont été plantées le 14 mai à 25 cm d'espacement. Les insectides ont été appliqués le 30 juin, le 6 et le 16 juillet au moyen d'un pulvérisateur monté sur tracteur (pression: 1723,7 k Pa, volume 1000 L/ha). L'évaluation des densités du doryphore (larves, adultes et masses d'oeufs) a été faite avant et après chacun des traitements à partir de 5 plants/parcelle répartis au hasard dans les 2 rangées du centre. Le dommage aux plants a été évalué visuellement pour chacune des parcelles. Le défanage à l'aide du Réglone a eu lieu le 12 août. Les deux rangées du centre ont été récoltées le 28 août afin de déterminer le rendement total en tubercules.

NOM ET ORGANISME:
DUCHESNE, R.-M.
Service de recherche en phytotechnie de Québec
Ministère de l'Agriculture, des Pêcheries et de l'Alimentation
2700, rue Einstein
Sainte-Foy, Québec G1P 3W8

RÉSULTATS: Voir tableau 1 ci-dessous.

CONCLUSION: Cet essai avec B.t. var. san diégo complètent les résultats obtenus dans les autres essais (volet 1, 2 et 3 du présent rapport). Il démontre l'efficacité des différents traitements et met en évidence la possibilité d'utiliser stratégiquement B.t. avec un insecticide chimique. En effet, les rendements obtenus avec les traitements No 1 et 3 sont sensiblement comparables et les densités larvaires sont demeurées très faibles et stables. L'évaluation du dommage suit sensiblement la même tendance. L'emploi seul de B.t. (tr. No 2), demeure très acceptable, compte tenu de la dose employée et des stades larvaires présents au moment du premier traitement. Les densités larvaires sont demeurées élevées et légèrement stables mais toutefois inférieure a celles du témoin. Il en est de même pour le dommage et le rendement qui sont significativement différents du témoin. L'utilisation combinée de B.t. avec un insecticide chimique sera fonction des densités des populations du doryphore et de l'importance des densités d'adultes, puisque B.t. est principalement efficace contre les jeunes larves. Cet emploi peut aussi permettre de retarder la date du premier traitement, diminuer le nombre d'intervention et réduire l'impact environnemental des insecticides chimiques.

Tableau 1. Population du doryphore (nombre moyen de larves/10 plants), dommage aux plants et rendement total en tubercules, saison 1987.

Traitement[1,2] Insecticide	Dose (g i.a./ha)	Population larvaire juin 29	Population larvaire juillet 6	9	14	21	Dommage[3] juillet 6	juillet 14	juillet 27	Août 6	Rendement (kg/parcelle)
1 BELMARK + M-ONE	37,5 207	41 ab[4]	9 b	10 b	31 b	21 ab	0,7 bc	2,0 b	2,7 bc	3,0 bc	44,23 a
2 M-ONE	207	44 a	58 ab	58 ab	118 a	55 a	1,5 a	2,6 b	3,2 b	3,7 b	41,62 a
3 BELMARK	37,5	21 b	10 b	10 b	23 b	14 b	0,5 c	2,0 b	2,0 c	2,0 c	46,65 a
4 Témoin		36 ab	90 a	112 a	130 a	44 ab	1,2 ab	4,2 a	4,7 a	5,5 a	33,24 b

1 Dates des traitements: 30 juin, 6 juillet et 16 juillet. Stades de l'insecte le 30 juin= 0,8 masses d'oeufs/plant, 0,4 adultes/plant, 80,0% L1+2, 20,0% L3+4.

2 BELMARK + M-ONE: Premier traitement avec BELMARK: deuxième et troisième traitement avec M-ONE.

3 Évaluation visuelle: Index de défoliation de 0 à 8 (0 a 100% de défoliation).

4 Les résultats suivis d'une même lettre ne sont pas significativement différents à un seuil de 0,05 (Duncan's Multiple Range Test).

N.B. Projet réalisé avec la collaboration de Claire Chouinard, technicienne.

CULTURE: Pomme de terre, cultivar Kennebec

RAVAGEUR: Doryphore de la pomme de terre, Leptinotarsa decemlineata (Say).

TITRE: ESSAI DE BACILLUS THURINGIENSIS VAR. SAN DIEGO, PÉRIODES D'APPLICATION, VOLET 3.

PRODUITS: M-ONE INSECTICIDE LI (endotoxine-delta de Bacillus thuringiensis, var. san diégo, à 4,5% i.a.).

MÉTHODES: L'essai a été effectué selon un dispositif de blocs casualisés avec 4 répétitions, constitués de parcelles de 7,5 m de longueur avec 4 rangs espacés de 0,91 m. Les pommes de terre ont été plantées le 21 mai à 25 cm d'espacement. Bacillus thuringiensis a été appliqué à différentes dates (voir tableau des résultats) au moyen d'un pulvérisateur monté sur tracteur (pression: 1723,7 k Pa, débit: 1000 L/ha, dose: 207,0 g i.a./ha ou 4,6 l/ha de produit commercial). L'évaluation des densité du doryphore (larves, adultes et masses d'oeufs) a été faite avant et après chacun des traitements a partir de 10 plants/parcelle répartis au hasard dans les 2 rangées du centre. Le dommage aux plants a été évalué visuellement pour chacune des parcelles. Le défanage à l'aide du Réglone a eu lieu le 26 août . Les deux rangées du centre ont été récoltées le 8 septembre afin de déterminer le rendement total en tubercules.

NOM ET ORGANISME:
DUCHESNE, R.-M.
Service de recherche en phytotechnie de Québec
Ministère de l'Agriculture, des Pêcheries et de l'Alimentation
2700, rue Einstein
Sainte-Foy, Québec G1P 3W8

RÉSULTATS: Voir tableau 1 ci-dessous.

CONCLUSION: Comme avec l'essai du projet volet 2 (présent rapport), le choix du cultivar Kennebec tout comme les densités trop faibles du doryphore ont affectés dans une certaine mesure les résultats. Il est toutefois possible de tirer certaines conclusion de cet essai préliminaire avec B.t. var. san diégo. La tendance observée dans les autres essais (volet 1, 2 et 4 du présent rapport) tend à se maintenir, à savoir: une efficacité relativement très bonne de B.t., un dommage peu élevé et un rendement très acceptable. La mortalité est lente à se manifester et il y a ralentissement et arrêt de la consommation par les larves suite aux traitements. Le peu de rémanence du produit et sa faible toxicité contre les larves âgées, dont les L2 et L3, font que les densités larvaires sont parfois demeurées assez stables et élevées malgré plusieurs traitements (No 1 et No 2). Enfin, même si le nombre de traitements a eu une influence sur les résultats obtenus, un traitement très hâtif (au début de l'émergence des L1) s'est avéré très efficace. La période d'intervention est très importante et peut être plus critique avec B.t. qu'avec des insecticides chimiques conventionnels.

Tableau 1. Population du doryphore (nombre moyen de larves/10 plants), dommage aux plants et rendement total en tubercules, saison 1987.

Traitements[1] Dates	Nbre	Population larvaire						Dommage[2]					Rendement
		juin		juillet				juillet				Août	
		22	29	2	7	13	21	2	7	13	27	6	(kg/parcelle)
1 23 juin, 2, 9 et 16 juillet	4	6 a[3]	32 a	32 ab	60 a	94 b	62 b	0,7 a	1,5 a	2,7 b	3,2 c	2,7 b	66,53 a
2 2 , 9 et 16 juillet	3	2 a	45 a	85 a	96 a	105 b	101 ab	1,2 a	1,7 a	2,7 b	3,5 bc	3,2 b	55,50 ab
3 23 juin, 9 juillet	2	2 a	11 a	15 b	65 a	117 ab	160 a	1,0 a	1,5 a	2,7 b	4,0 ab	3,5 ab	55,31 ab
4 2 juillet	1	0 a	10 a	64 ab	108 a	157 a	118 ab	1,0 a	1,5 a	3,2 ab	4,0 ab	4,2 a	55,40 ab
5 Témoin		3 a	28 a	50 ab	130 a	113 ab	132 a	1,2 a	2,0 a	3,7 a	4,2 a	4,2 a	53,37 b

1 Périodes choisies pour les traitements et stades de l'insecte. Périodes= Traitement No 1: Début d'émergence des L1 et à chaque semaine; traitement No 2: au pic des jeunes larves et à chaque semaine; traitement No 3: début d'émergence des L1 et deux semaines après; traitement No 4: au pic des jeunes larves seulement. Stades de l'insecte= 23 juin: 0,3 masses d'oeufs/plant, 0,2 adultes/plant, 100% L1; 2 juillet: 0,2 masses d'oeufs/plant, 0,1 adultes/plant, 88,1% L1+2, 11,9% L3+4.

2 Évaluation visuelle: Index de défoliation de 0 à 8 (0 à 100% de défoliation).

3 Les résultats suivis d'une même lettre ne sont pas significativement différents à un seuil de 0,05 (Duncan's Multiple Range Test).

N.B. Projet réalisé avec la collaboration de Claire Chouinard, technicienne.

CULTURE: Pomme de terre, cultivar Kennebec

RAVAGEUR: Doryphore de la pomme de terre, Leptinotarsa decemlineata (Say).

TITRE: ESSAI DE BACILLUS THURINGIENSIS VAR. SAN DIEGO A DIFFÉRENTES DOSES, VOLET 2.

PRODUITS: Belmark 300 EC (fenvalérate), M-ONE INSECTICIDE LI (endotoxine-delta de bacillus thuringiensis, var. san diego, à 4,5% i.a.).

MÉTHODES: L'essai a été effectué selon un dispositif de blocs casualisés avec 4 répétitions, constitués de parcelles de 7,5 m de longueur avec 4 rangs espacés de 0,91 m. Les pommes de terre ont été plantées le 20 et 21 mai à 25 cm d'espacement. Les insecticides ont été appliqués le 30 juin, le 6 et le 16 juillet au moyen d'un pulvérisateur monté sur tracteur (pression: 1723,7 k Pa, volume: 1000 L/ha). L'évaluation des densités de doryphore (larves, adultes et masses d'oeufs) a été faite avant et après chacun des traitements à partir de 10 plants/ parcelle répartis au hasard dans les 2 rangées du centre. Le dommage aux plants a été évalué visuellement pour chacune des parcelles. Le défanage à l'aide du Réglone a eu lieu le 26 août. Les deux rangées du centre ont été récoltées le 8 septembre afin de déterminer le rendement total en tubercules.

NOM ET ORGANISME:
DUCHESNE, R.-M.
Service de recherche en phytotechnie de Québec
Ministère de l'Agriculture, des Pêcheries et de l'Alimentation
2700, rue Einstein
Sainte-Foy, Québec G1P 3W8

RÉSULTATS: Voir tableau 1 ci-dessous.

CONCLUSION: Cet essai n'est pas suffisamment concluant, principalement dû au choix du cultivar Kennebec. Ce cultivar affecte le développement de l'insecte et son feuillage très luxuriant toute la saison masque beaucoup le dommage. Cependant, l'essai démontre certaines tendances non négligeables. En regard de l'ensemble des résultats, il y a une différence à peu près constante dans l'efficacité comparative des trois doses de B.t. Cette différence n'est cependant pas significative statistiquement. Ces différences sont plus évidentes lorsque l'on compare les résultats avec le témoin, surtout pour les doses de 414 et 207 g i.a./ha de B.t. Comparativement à BELMARK ces deux doses semblent présenter une meilleure performance, et ce, même si les résultats tendent à être inférieurs à ceux obtenus avec BELMARK. Pour cet essai préliminaire, B.t. a tout de même été relativement efficace avec des rendements pour les traitements 1 et 2 de 8% à 14% plus bas que celui obtenu avec Belmark. Pour être encore plus compétitif il faudra augmenter la toxicité de B.t. pour les stades plus âgés (L2 et L3) et accroître la persistance et la rémanence du produit. D'après nos observations, B.t. a été très toxique presqu'uniquement contre les L1. De plus, il a démontré une très faible rémanence, probablement liée à la nature même de ce nouveau B.t. et à la formulation du produit.

Tableau 1. Population du doryphore (nombre moyen de larves/10 plants), dommage aux plants et rendement total en tubercules, saison 1987.

Traitement[1] Insecticide	Dose (g i.a./ha)	Population larvaire juin 29	Population larvaire juillet 6	Population larvaire juillet 9	Population larvaire juillet 14	Population larvaire juillet 21	Dommage[2] juillet 6	Dommage[2] juillet 14	Dommage[2] juillet 27	Dommage[2] août 6	Rendement (kg/parcelle)
1 M-ONE	414,0	60 a[3]	79 ab	45 b	129 bc	72 a	1,5 ab	2,7 b	3,5 a	3,2 b	66,86 ab
2 M-ONE	207,0	59 a	98 ab	64 ab	123 bc	77 a	1,5 ab	3,0 b	3,2 a	3,5 b	62,53 ab
3 M-ONE	103,5	54 a	94 ab	105 a	240 a	99 a	1,5 ab	3,5 b	3,5 a	3,7 b	57,54 b
4 BELMARK	37,5	77 a	30 b	25 b	77 c	28 a	1,0 b	2,0 c	2,2 b	2,0 c	72,24 a
5 Témoin		59 a	147 a	110 a	169 b	98 a	2,2 a	4,2 a	4,0 a	9,0 a	57,17 b

1 Dates des traitements: 30 juin, 6 juillet et 16 juillet. Stades de l'insecte le 30 juin= 0,67 masses d'oeufs/plant, 0,07 adultes/plant, 84,9% L1+2, 15,1% L3+4.

2 Évaluation visuelle: Index de défoliation de 0 à 8 (0 à 100% de défoliation).

3 Les résultats suivis d'une même lettre ne sont pas significativement différents à un seuil de 0,05 (Duncan's Multiple Range Test).

N.B. Projet réalisé avec la collaboration de Claire Chouinard, technicienne.

CULTURE: Pomme de terre, cultivar Superior

RAVAGEUR: Doryphore de la pomme de terre, Leptinotarsa decemlineata (Say).

TITRE: ESSAI D'INSECTICIDES PAR APPLICATION FOLIAIRE, VOLET 1.

PRODUITS: GUTHION 50 WP (azinphos-méthyl), CAPTURE 2.4 EC (bifenthrin), BELMARK 300 EC (fenvalérate), M-ONE INSECTICIDE LI (endotoxine - delta de bacillus thuringiensis, var. san diego à 4.5% i.a.), HOE 000522 1,5 EC, POUNCE 384 EC (perméthrine), ZOLONE 500 FLO (phosalone).

MÉTHODES: L'essai a été effectué selon un dispositif de blocs casualisés avec 4 répétitions, constitués de parcelles de 7,5 m de longueur avec 4 rangs espacés de 0,91 m. Les pommes de terre ont été plantées le 19 et 20 mai à 25 cm d'espacement. Les insecticides ont été appliqués le 30 juin, le 6 et le 31 juillet au moyen d'un pulvérisateur monté sur tracteur (pression: 1723,7 k Pa, volume: 1000 L/ha). L'évaluation des densités du doryphore (larves, adultes et masses d'oeufs) a été faite avant et après chacun des traitements à partir de 10 plants/parcelle répartis au hasard dans les 2 rangées du centre. Le dommage aux plants a été évalué visuellement pour chacune des parcelles. Le défanage à l'aide du Réglone a eu lieu le 7 août. Les deux rangées du centre ont été récoltées le 27 août afin de déterminer le rendement total en tubercules.

NOM ET ORGANISME:
DUCHESNE, R.-M.
Service de recherche en phytotechnie de Québec
Ministère de l'Agriculture, des Pêcheries et de l'Alimentation
2700, rue Einstein
Sainte-Foy, Québec G1P 3W8

RÉSULTATS: Voir tableau 1 ci-dessous. A noter que pour le 13 juillet, les traitements n'ont eu que très peu d'incidence sur les populations larvaires. Ils ont été tardifs et le feuillage a été délavé par une forte précipitation 2 heures après les traitements.

CONCLUSION: Dans l'ensemble, tous les insecticides ont relativement donné de bons résultats. Pour plusieurs produits, les rendements obtenus sont sensiblement comparables. Les différences sont plus marquées avec l'évaluation des densités larvaires et du dommage. Comme en 1986, CAPTURE est demeuré très performant. CAPTURE et HOE (30 g i.a./ha) ont permis des rendements plus élevés, des densités larvaires et un dommage foliaire plus faibles au cours de la saison. Pour les densités du doryphore observées, les doses minimales utilisées pour CAPTURE, HOE et aussi ZOLONE sont très efficaces et économiquement plus rentables que les doses maximales. Les résultats avec POUNCE tendent à démontrer une perte d'efficacité du produit contre le doryphore. Bacillus thuringiensis s'est révélé très efficace malgré un emploi trop tardif, une dose probablement trop faible et une formulation peu stable. D'après nos observations visuelles, l'impact du GUTHION et de ZOLONE sur les coccinelles a été très important, alors qu'il a été moyen avec CAPTURE et de faible à nul avec les autres produits.

Tableau 1. Population du doryphore (nombre moyen de larves/10 plants), dommage aux plants et rendement total en tubercules, saison 1987.

Traitement Insecticide	Dose (g/ha i.a.)	Population larvaire						Dommage[2]				Rendement
		juin	juillet					juillet			août	
		30[1]	2	6[1]	10	13[1]	17	6	13	27	6	(kg/parcelle)
1 GUTHION	350	135 a[3]	81 bc	98 cde	34 e	42 cd	55 bcd	2,0 bc	2,7 c	3,7 cd	3,7 cd	43,53 bc
2 CAPTURE	48	153 a	61 c	43 e	36 e	44 cd	38 cd	1,5 c	1,2 d	3,0 e	2,5 e	53,53 a
3 CAPTURE	24	132 a	78 bc	97 cde	117 bcde	99 bc	91 bc	2,7 ab	3,2 bc	3,5 de	4,2 c	51,02 ab
4 BELMARK	37,5	122 a	83 bc	79 de	90 cde	77 c	119 ab	1,7 c	3,0 bc	4,0 bcd	4,5 c	44,91 abc
5 B.T. M-ONE	207	118 a	131 abc	229 ab	161 bc	142 ab	176 a	2,2 abc	3,7 b	4,5 b	5,5 b	44,06 bc
6 HOE 000522	30	99 a	178 ab	118 cde	69 de	13 d	18 d	2,2 abc	2,7 c	3,0 e	3,0 de	49,31 abc
7 HOE 000522	15	131 a	218 a	203 abc	141 bcd	46 cd	32 cd	2,2 abc	3,5 bc	4,0 bcd	3,2 de	45,40 abc
8 POUNCE	71	157 a	111 bc	161 bcd	178 b	77 c	115 ab	2,2 abc	3,2 bc	4,2 bc	6,0 b	41,47 c
9 ZOLONE	875	134 a	92 bc	138 bcde	85 cde	49 cd	97 bc	2,2 abc	3,2 bc	4,0 bcd	3,7 cd	43,63 bc
10 ZOLONE	625	119 a	130 abc	133 bcde	91 cde	81 c	100 bc	2,0 bc	3,2 bc	3,7 cd	4,2 c	44,54 bc
11 Témoin		138 a	174 ab	279 a	314 a	183 a	169 a	3,0 a	6,0 a	6,5 a	7,5 a	28,84 d

N.B. Projet réalisé avec la collaboration de Claire Chouinard, technicienne.

1 Dates des traitements. Stades de l'insecte le 30 juin= 0,8 masses d'oeufs/plant, 0,3 adultes/plant, 74,8% L1+2, 25,2% L3+4.

2 Évaluation visuelle: Index de défoliation de 0 à 8 (0 à 100% de défoliation).

3 Les résultats suivis d'une même lettre ne sont pas significativement différents à un seuil de 0,05 (Duncan's Multiple Range Test).

CROP: Potatoes , cv. Superior

PEST: Colorado potato beetle, Leptinotarsa decemlineata (Say)

TITLE: PROTECTION OF POTATOES BY FORMULATIONS OF BACILLUS THURINGIENSIS AND FURADAN

NAME AND AGENCY: JAQUES, Robert P. and LAING, D.R.
Agriculture Canada
Research Station
Harrow, Ontario
NOR 1GO

MATERIALS: M-ONE, 4.5%(Bacillus thuringiensis var. san diego;) DI-BETA, 34.5 g Thuringiensin (Bacillus thuringiensis B-exotoxin)/L.; FURADAN 480 F (carbofuran)

METHODS: Plots of potato cv Superior at Harrow, each 4 rows, 7 m long, 1 m between rows with 2 m between plots were replicated 3 times in randomized blocks. Aqueous suspensions (1.5 L/plot) of insecticides were applied with a compressed-air sprayer on May 29, June 4, 11 and 19, 1987. Larvae and adults of the Colorado potato beetle were enumerated and foliar damage was assessed weekly on 10 plants/plot. FURADAN was applied in the first spray followed by a formulation of B.t. in the 2nd, 3rd and 4th spray to plots treated by combined programs. Tubers were weighed at harvest (July 17).

RESULTS: Numbers of larvae of the potato beetle were similar in plots treated with M-ONE, DI-BETA and carbofuran but yield of tubers was higher in the plots treated with carbofuran. Protection of foliage was less in plots treated with M-ONE. An initial application of carbofuran followed by 3 applications of DI BETA or M-ONE was as effective as 4 applications of carbofuran in reducing numbers of larvae, but the latter mixture had a less positive effect on yield.

CONCLUSIONS: The plot test showed that the formulations of B.t. are effective alternatives to the chemical insecticide carbofuran in programs to protect potatoes against the Colorado potato beetle.

PLOT TREATMENT	POPULATIONS OF POTATO BEETLE Larvae (+ Adults)/10 Plants				CROP DAMAGE % of Foliage Eaten		YIELD
	Je2	Je8	Je17	Je24	Je8	Je24	Tonnes/ha
M-ONE 0.25X[1]	177bc(3)[2]	295b (2)	196a (0)	51ab(17)	15	62	6.37 b
M-ONE 0.5X	254b (4)	164bc(2)	197a (1)	68a (12)	8	47	7.78 bc
M-ONE 1X	193bc(5)	112c (2)	82bc (3)	56a (6)	5	14	13.41 de
M-ONE 2X	144bc(5)	18c (1)	19c (1)	9c (5)	2	4	12.23 cde
DI-BETA 0.5X	204bc(4)	130bc(1)	51c (1)	20bc(1)	4	1	11.83 cd
DI-BETA 1X	187bc(3)	84c (2)	1c (3)	21bc(8)	5	2	13.10 de
Carbofuran 1X + M-ONE 1X	50c (3)	35c (1)	99abc(0)	7c (5)	3	4	14.89 de
Carbofuran 1X + DI-BETA 1X	34c (2)	15c (6)	28c (1)	3c (1)	4	1	16.90 ef
Carbofuran 1X	40c (2)	0c (0)	0c (0)	0c (6)	3	1	20.03 f
Nontreated check	494a (1)	529a (1)	162ab (1)	17c (45)	50	93	1.35 a

[1] 1X rates/ha were M-ONE, 4.676 L, DI-BETA, 5.8 L, and FURADAN 480 F, 550 ml.

[2] Data followed by same letter are not significantly different (p=0.05) by Duncan's Multiple Range Tes

CROP: Potato, cv. Shepody

PEST: Colorado Potato Beetle
Leptinotarsa decemlineata (Say)

TITLE: CONTROL OF COLORADO POTATO BEETLE IN POTATO WITH VARIOUS FORMULATIONS OF DELTAMETHRIN.

MATERIALS: DECIS 2.5 EC, (deltamethrin), DECIS 5.0 F, DECIS 20.0 F, DECIS 5% WP.

METHODS: Potato tubers were planted on June 2, 1987, in rows 1m apart. Insecticide treatments were applied on July 18, 1987, using a CO_2 pressurized sprayer with SS8002 nozzles delivering 172 L/ha at a pressure of 275 kPa. Each plot was 6.5m long and consisted of 2 potato rows. Treatments were replicated four times in a randomized complete block design. Assessments were made at 2, 5 and 11 days after application. The number of live larvae on 3 randomly chosen potato plants/plot were recorded. At the time of application the potato beetle larvae were in the 1-4 instar stage.

NAME AND AGENCY:
McDONALD, I.D.
Hoechst Canada Inc.,
Cambridge, ON
N1R 5Y2

RESULTS: Results of the experiment are summarized in the table below.

CONCLUSIONS: All chemical treatments resulted in a significant reduction in the number of live larvae compared to the control. This significant reduction was found at the three post application assessment dates. There was no significant difference in the level of performance of the various DECIS formulations on any of the assessment dates.

TREATMENT	RATE (g ai/ha)	LIVE COLORADO POTATO BEETLE LARVAE COUNTS[1]			
		PRE SPRAY COUNTS	POST APPLICATION COUNTS		
		JULY 18	JULY 20	JULY 23	JULY 29
CONTROL	-	21.5 NSD[2]	39.3 a [3]	31.3 a	17.8 a
DECIS 2.5 EC	7.5	26.0	7.8 b (83.6)[4]	8.8 b (76.8)	1.3 b (94.0)
DECIS 5.0 F	5.0	30.3	21.8 b (60.6)	11.8 b (73.2)	3.5 b (86.4)
DECIS 5.0 F	7.5	26.8	3.0 b (93.9)	2.3 b (94.1)	2.8 b (87.4)
DECIS 20.0 F	7.5	35.3	3.8 b (94.1)	2.5 b (95.1)	4.8 b (83.6)
DECIS 5% WP	7.5	27.0	0.5 b (99.0)	1.5 b (96.2)	2.5 b (88.8)

[1] Average number of live larvae per 3 plants.

[2] NSD = not significantly different ($p = 0.05$)

[3] Values followed by the same letter are not significantly different ($p = 0.05$) according to Duncan's Multiple Range Test.

[4] Percentage population reduction compared to the control as determined by use of Abbott's formula.

CROP: Potato, cv. Superior

PEST: Colorado Potato Beetle, Leptinotarse decemlineata, Leafhoppers, Empoasca fabae

TITLE: SCREENING INSECTICIDES FOR THE CONTROL OF FOLIAR INSECTS IN POTATOES IA

MATERIALS: LORSBAN 480E (chlorpyrifos), GUTHION 35WP, 350F, 240SC and 50WP (azinphos-methyl), CAPTURE 240EC (bifenthrin), ZOLONE 500 Flo (phosalone)

METHODS: Potatoes were planted in 2 row plots, 6m in length with rows spaced 1m apart, replicated 4 times in a randomized complete block design. Potato seed pieces were planted with a commercial planter on April 29. Spray applications were made using a back pack airblast sprayer using 240 L/ha of water. Treatments were applied on June 2, 11, 30, July 15 and 29. Assessments were taken by visually rating the foliage for Colorado beetle larval damage on June 4, 24, and July 28 and for leafhopper damage on July 17 and 28. Yields were taken at harvest on August 13.

NAME AND AGENCY:
PITBLADO, R.E.
Ridgetown College of Agricultural Technology
Ridgetown, Ontario, N0P 2C0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Colorado potato beetle populations were high resulting in significant defoliation to the non treated check. All insecticidal treatments effectively reduced the leaf feeding damage caused by the potato beetles throughout the season. There were no significant differences in the level of control of Colorado Potato Beetles amongst the formulations of GUTHION. Leafhopper injury was effectively reduced using either CAPTURE 240EC or ZOLONE 500 Flo while LORSBAN and GUTHION were ineffective.

Treatments	Rate kg ai/ha	Colorado Potato Beetle Foliar Ratings (0-10)[1] June 10	June 24	July 28	Leafhoppers Foliar Ratings (0-10)[2] July 17	July 28	Yield Tonnes/ha
LORSBAN 480E	0.48	10.0a*	9.8a	6.5b	4.8d	2.3cd	28.7a
GUTHION 35WP	0.35	10.0a	9.8a	7.0b	6.0c	2.0d	32.1a
GUTHION 360F	0.35	10.0a	10.0a	7.0b	5.0cd	2.0d	31.1a
GUTHION 240SC	0.35	10.0a	10.0a	7.0b	5.3cd	2.0d	33.3a
GUTHION 50WP	0.35	10.0a	9.8a	7.0b	5.5cd	3.0c	33.4a
CAPTURE 240EC	0.036	9.9a	8.8b	7.0b	9.0a	5.0b	33.0a
CAPTURE 240EC	0.024	9.8a	6.5c	7.8a	8.8ab	6.5a	31.5a
ZOLONE 500 Flo	0.625	10.0a	9.5ab	7.8a	8.0b	5.0b	29.6a
ZOLONE 500 Flo	0.875	10.0a	9.8a	7.8a	8.3ab	6.3a	33.9a
Check		6.0b	5.0d	1.5c	5.0cd	1.0e	12.2b

*Values followed by the same letter are not significantly different at the 5% level. (Duncan's Multiple Range Test)

1/ Colorado Potato Beetle Foliar Ratings (0-10); 0, no control, foliage severely damaged, 10, complete control, no insect damage

2/ Leafhopper Foliar Ratings (0-10); 0, no control, foliage severely damaged, 10, complete control, no insect damage

CROP: Potato, *Solanum tuberosum*, cv. Kennebec

PEST: Colorado potato beetle, *Leptinotarsa decemlineata* (Say).

TITLE: CONTROL OF COLORADO POTATO BEETLES WITH FOLIAR-APPLIED INSECTICIDES ON POTATOES

NAME AND AGENCY:
SEARS, M.K. and MCGRAW, R.R.
Department of Environmental Biology
University of Guelph
Guelph, Ontario N1G 2W1

MATERIALS: LAB 166 801 100 g/L, DECIS 2.5 EC (deltamethrin), DECIS 5 F (deltamethrin), HOE 000522 150 F, ABG - 6198A 3 SC (*Bacillus thuringiensis*), M-One (*Bacillus thuringiensis*), ZOLONE 500 F (phosalone).

METHODS: Potatoes were seeded on May 13 in 4-row plots, 15 m long. Rows were spaced at 0.9 m and plots were separated by 3 m spray lanes. Populations of Colorado potato beetle were monitored each week by taking 10 sweep net samples from each plot with a standard 90 cm diam net. The number of Colorado potato beetle larvae and adults recovered in these samples was compared to a predetermined threshold for insecticide treatments. When the average number of beetles in the samples from four replicates of each treatment exceeded 10, that treatment was applied to the respective plots. The thresholds were determined by using both adult and larva counts but the evaluation was done on the larval forms alone because the pesticides used in this experiment are for the most part biological in nature and are intended to be most effective against the immature forms. Insecticides were applied with a tractor-mounted, four-row boom sprayer that delivered 800 L/ha at 450 kPa. Treatments were arranged in a randomized complete block design. All treatments were initially applied on June 29. The action of *Bacillus thuringiensis* and these growth regulators is slower than conventional pesticides and therefore a second application of these materials was made on July 6 regardless of the threshold count. Application of other treatments is indicated by an asterisk following the values on the date just prior to the date of application (Table 1). Yield data was obtained by harvesting and weighing the centre 2 rows of each plot on September 16.

RESULTS: See Table 1.

CONCLUSIONS: None of the treatments gave satisfactory control of the first generation of larvae. It required two or three repeated applications of LAB 166 801, DECIS, HOE 000522, ABG 6198A and MICOGEN to bring the second generation under control. Zolone controlled the second generation with a single application.

TABLE 1. Mean number of Colorado potato beetle larvae per 10 sweep samples from plots of potatoes, cv. Kennebec, 1987.

		Mean[1] number of insects per 10 sweeps						
		COLORADO POTATO BEETLE LARVAE						
Material	Rate (g a.i./ha)	July 2	July 9	July 30	Aug. 6	Aug. 13	Aug. 20	Yield
LAB 166 801	50	16.5a*	2.3a*	3.3d	16.0c	4.5e	9.0b	85.1abcd
DECIS 2.5	5	2.5a*	2.5a	28.3abc*	18.3abc*	11.3de*	7.8b	83.4abcd
DECIS 5	5	1.5a	3.5a	12.8cd*	14.5bc*	17.3cde*	8.3b	87.2abcd
HOE 000522	15	34.8a*	3.5a	11.8cd*	18.5abc*	4.0e*	0.0b*	74.9d
HOE 000522	25	11.0a*	3.5a	3.5d	22.5abc*	30.0bc*	2.5b	81.1bcd
ABG 6198A	75	7.5a*	7.8a	8.8cd*	20.8abc*	13.3de*	8.8b	78.9cd
ABG 6198A	150	2.0a*	2.0a	7.8d*	17.5abc*	11.0de*	5.0b	84.1abcd
M-One	30 qts U.S./acre	4.3a*	6.3a	10.0cd*	23.0abc*	43.8ab*	44.5a	80.6bcd
ZOLONE	625	2.3a	10.4a*	19.0bcd*	4.8e	4.8e	3.5b	85.8abcd
ZOLONE	275	0.5a	0.3a	14.3cd*	6.0e*	2.3e	5.8b	78.4cd
CHECK	-	14.3a	12.8a	16.5cd*	24.8abc	25.3cd	38.3a	74.3d

1. Means in columns followed by the same letter are not significantly different at P = 0.05 (Duncan's New Multiple Range Test).

* Treatment applied following this date and prior to next observation.

CROP: Potato var. Kennebec

PEST: Colorado Potato Beetle, Leptinotarsa decemlineata (Say), Potato Leafhopper, Empoasca fabae (Harris), Green Peach Aphid, Myzus persicae (Sulzer)

TITLE: EVALUATION OF INSECTICIDES FOR THE CONTROL OF INSECT PESTS OF POTATO, 1987

MATERIALS: KARATE 50 EC (PP 321 50 g/L), CYMBUSH 250 EC (cypermethrin 250 g/L), SYS-TEM 480 EC (dimethoate 480 g/L)

METHODS: Plots consisted of 3 rows, each 5 meters long and were replicated 4 times in a completely randomized block design. The trial was seeded May 20. Treatments were applied June 30 with a CO_2 sprayer calibrated to deliver 500 L/ha at a pressure of 315 kPa. The middle row of each plot was assessed by inspecting plants for insects and by counting insects captured in a standard sweep net. Location: Burlington, Ontario. (DAT=Days after treatment)

NAME AND AGENCY:

SMITH, D.B.
Chipman, A Business Unit of C-I-L Inc.
400 Jones Road
Stoney Creek, Ontario
L8G 3Z1

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All insecticide treatments significantly reduced numbers of green peach aphids, potato leafhoppers and Colorado potato beetle larvae. CYMBUSH was significantly less effective than KARATE for controlling green peach aphid. No improvement in control was observed with the addition of SYS-TEM to KARATE.

TREATMENT	RATE (kg ai/ha)	GREEN PEACH APHID[1] July 7 (6 DAT)	July 10 (9 DAT)	July 28 (27 DAT)	POTATO LEAF HOPPER[2] July 7 (6 DAT)	July 10 (9 DAT)	July 28 (27 DAT)
KARATE 50 EC	0.0100	0.0 a* (100)[4]	9.5 a (82)	3.4 a	0.7 a (88)	1.1 a	7.0 a
KARATE 50 EC	0.0125	0.6 a (94)	13.2 a (74)	1.1 a	0.0 a (100)	0.2 a	6.8 a
CYMBUSH 250 EC	0.0350	2.2 a (77)	28.8 b (44)	1.3 a	0.0 a (100)	0.0 a	7.5 a
KARATE 50 EC + SYS-TEM 480 EC	0.0100 + 0.2600	0.2 a (98)	12.6 a (76)	1.6 a	0.0 a (100)	0.3 a	8.7 a
Check	-	9.6 b -	51.7 c -	3.2 a	7.3 b -	1.1 a	11.5 a

TREATMENT	RATE (kg ai/ha)	COLORADO POTATO BEETLE[3] July 7 (6 DAT)	July 10 (9 DAT)	July 14 (13 DAT)	July 28 (27 DAT)
KARATE 50 EC	0.0100	0.6 a (98)	0.0 a (100)	1.2 a	2.1 a
KARATE 50 EC	0.0125	0.5 a (99)	0.0 a (100)	0.2 a	2.0 a
CYMBUSH 250 EC	0.0350	0.0 a (100)	0.0 a (100)	0.2 a	1.5 a
KARATE 50 EC + SYS-TEM 480 EC	0.0100 + 0.2600	0.0 a (100)	0.2 a (99)	3.8 a	2.9 a
Check	-	31.7 b -	21.9 b -	1.5 a	1.8 a

1. Mean number of leaflets infested per 20 haulms per plot.
2. Mean number of insects per 5 plot sweeps.
3. Mean number of larvae per 5 plants per plot.
4. Percent control relative to numbers in the check plots.

* Treatment means in the same column followed by the same letter are not significantly different at the 5% level (t-test).

CROP: Potatoes, cv. Kennebec

PEST: Colorado potato beetle (C.P.B.) *Leptinotarsa decemlineata* (Say) and Potato flea beetle (P.F.B.) *Epitrix cucumeris* (Harris)

TITLE: THE EFFECT OF A HERBICIDE TANK MIX ON SEVERAL TYPES OF INSECTICIDES IN CONTROLLING COLORADO POTATO BEETLES AND FLEA BEETLES ON POTATOES, 1987.

MATERIALS: POAST (sethoxydim), AMSUL (ammonium sulfamate), ASSIST (surfactant), FURADAN (carbofuran), MONITOR (methamidophos), DECIS (deltamethrin).

METHODS: Potatoes were planted on May 11 in 4-row plots, 7.5 m in length with rows spaced 0.9 m apart and replicated 4 times in a randomized complete block design. Sprays were originally scheduled to be applied when the overwintering flea beetle populations began to peak on potatoes and when quackgrass control would be best. Good populations of fleabeetles did not materialize, however, until August 13 when all treatments were applied using a 4-cone nozzled CO_2 precision sprayer at 240 kPa in 450 L water/ha. No assessment of herbicide effectiveness on quackgrass control could be made at this late date. The number of flea beetles and C.P.B. per 10 net sweeps were counted on August 13 (pre-spray) and on August 14 and 17 (post-spray).

NAME AND AGENCY:
THOMPSON, L.S., J.G. STEWART, and J.E. LUND
Agriculture Canada, Research Station
Charlottetown, Prince Edward Island
C1A 7M8

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Tank mixing a Tri-Pak of POAST + ASSIST + AMSUL did not affect the efficacy of the three insecticides tested in controlling C.P.B. and Flea beetle populations on potatoes. The tank mixes did not appear to be phytotoxic as no symptoms were noted on the potato foliage. Hot dry weather following the spray date seemed to lessen the effect of DECIS as flea beetle populations began reappearing by the fourth day post-spray on plots which were adjacent to unsprayed check plots.

TREATMENT	RATE (kg ai/ha)	NUMBER OF INSECTS PER 10 NET SWEEPS					
		Aug. 13		Aug. 14		Aug. 17	
		C.P.B.	P.F.B.	C.P.B.	P.F.B.	C.P.B.	P.F.B.
Check		28a[1]	613a	28a	221a	16b	380b
POAST+ASSIST+AMSUL (TRI-PAK)	0.5+2.0L+4.0L	38a	598ab	30a	203a	23a	492a
TRI-PAK+FURADAN	0.5+2.0L+4.0L+0.52	28a	414b	1b	1b	1c	15d
TRI-PAK+MONITOR	0.5+2.0L+4.0L+0.84	29a	590ab	2b	4b	2c	16d
TRI-PAK+DECIS	0.5+2.0L+4.0L+0.075	22a	556ab	2b	1b	3c	28d
FURADAN	0.52	38a	491ab	1b	4b	1c	16d
MONITOR	0.84	33a	642a	5b	5b	2c	18d
DECIS	0.075	24a	548ab	2b	3b	4c	119c

[1]Means within a column followed by the same letter are not significantly different at P=0.05 (D.M.R.T.).

CROP: Potato, cv. Kennebec

PEST: Colorado potato beetle, Leptinotarsa decemlineata (Say)

TITLE: THE EFFECT OF TIMING OF APPLICATION ON CONTROL OF COLORADO POTATO BEETLES WITH AN INSECT GROWTH REGULATOR AND WITH A BACTERIAL INSECTICIDE, 1987.

MATERIALS: HOE 000522 (teflubenzuron), M-ONE (Bacillus thuringiensis san diego)

METHODS: Potatoes were planted on May 11 in 4-row plots, 7.6 m in length with rows spaced 0.9 m apart, and replicated four times in a randomized complete block design. Treatments were applied as sprays using a 4-cone nozzled CO_2 precision sprayer at 240 kPa in 450 L water/ha on July 10 (early hatch E.H.); July 17 (1 week post E.H.); and on July 23 (2 weeks post E.H.). BRAVO was sprayed as required for blight control. All Colorado potato beetles (C.P.B.) on plants in the two centre rows of each plot were counted on July 9, July 15, July 23, July 29, August 7, August 10, and August 17.

NAME AND AGENCY:
THOMPSON, L.S., J.G. STEWART, and J.E. LUND
Agriculture Canada, Research Station
Charlottetown, Prince Edward Island
C1A 7M8

RESULTS: The results are summarized in the tables below.

CONCLUSIONS: The insect growth regulator HOE 000522 controlled C.P.B. populations best when applied at early hatch or 1 week post early hatch. The bacterial insecticide M-ONE controlled C.P.B. populations best when applied 1 week post early-hatch. Populations of adults increased late in the season on plots which received late applications of HOE 000522. Tuber yields were not increased significantly by any of the insecticide applications; however, a yield increase of 6.7% over the check was recorded from plots treated with M-ONE 1 week post early-hatch.

TREATMENT AND RATE (kg ai/ha)		APPLICATION TIME	AVE. NO. COLORADO POTATO BEETLE LARVAE/2 CENTRE ROWS						
			July 9	July15	July23	July29	Aug.7	Aug.10	Aug.17
Check		-	23 b[1]	110 bc	307ab	217a	203a	72ab	23a
HOE 000522	.025	early hatch	39ab	48 c	24 c	13 c	3 c	3 c	2 b
HOE 000522	.025	1 wk post E.H.	53ab	247ab	68 c	22 c	5 c	1 c	0 b
HOE 000522	.025	2 wk post E.H.	86a	292a	508a	60 bc	35 bc	18 c	4 b
M-ONE	6.9L Prod.	early hatch	37ab	56 c	247 bc	178a	147ab	102a	9 b
M-ONE	6.9L Prod.	1 wk post E.H.	38ab	225ab	46 c	59 bc	72 bc	35 bc	10 b
M-ONE	6.9L Prod.	2 wk post E.H.	40ab	145abc	312ab	140ab	65 bc	39 bc	9 b

[1]Means within a column followed by the same letter are not significantly different at P=0.05 (D.M.R.T.).

TREATMENT AND RATE (kg ai/ha)		APPLICATION TIME	AVE. NO. COLORADO POTATO BEETLE ADULTS/2 CENTRE ROWS						
			July 9	July15	July23	July29	Aug.7	Aug.10	Aug.17
Check		-	4a[1]	3a	1a	1a	12 b	23 b	126a
HOE 000522	.025	early hatch	4a	2a	2a	1a	2 b	2 b	15 c
HOE 000522	.025	1 wk post E.H.	3a	4a	1a	1a	11 b	13 b	11 c
HOE 000522	.025	2 wk post E.H.	2a	5a	1a	3a	40a	101a	105ab
M-ONE	6.9L Prod.	early hatch	4a	3a	1a	2a	3 b	8 b	53 bc
M-ONE	6.9L Prod.	1 wk post E.H.	3a	3a	0a	2a	9 b	17 b	39 c
M-ONE	6.9L Prod.	2 wk post E.H.	1a	3a	1a	1a	11 b	34 b	63 bc

[1]Means within a column followed by the same letter are not significantly different at P=0.05 (D.M.R.T.).

TREATMENT AND RATE (kg ai/ha)		APPLICATION TIME	TUBER YIELD (KGS/2 CENTRE ROWS)		% YIELD INCREASE OVER CHECK
			TOTAL	MARKETABLE	MARKETABLE
Check		-	42.3 a[1]	37.5a	-
HOE 000522	.025	early hatch	42.9 a	38.0a	1.2
HOE 000522	.025	1 wk post E.H.	44.1 a	38.0a	1.2
HOE 000522	.025	2 wk post E.H.	40.1 a	34.4a	-
M-ONE	6.9L Prod.	early hatch	42.4 a	37.2a	-
M-ONE	6.9L Prod.	1 wk post E.H.	44.6 a	40.0a	6.7
M-ONE	6.9L Prod.	2 wk post E.H.	40.9 a	34.9a	-

[1]Means within a column followed by the same letter are not significantly different at P=0.05 (D.M.R.T.).

CROP: Potato, cv. Kennebec

PEST: Colorado potato beetle, Leptinotarsa decemlineata (Say)

TITLE: CONTROL OF COLORADO POTATO BEETLES WITH INSECTICIDES AND INSECT GROWTH REGULATORS, 1987.

MATERIALS: CAPTURE (FMC-54800), HOE 000522 (teflubenzuron), DITHANE M45 (mancozeb), BRAVO (chlorothalonil), M-ONE (Bacillus thuringiensis san diego), FASTAC (WL-85871), BASUDIN (diazinon), BASF LAB 166801.

METHODS: Kennebec seed pieces were planted on May 11 in 4-row plots, 7.6 m in length with rows spaced 0.9 m apart, and replicated four times in randomized complete block design. All treatments were applied as sprays on July 14 using a 4-cone nozzled CO_2 precision sprayer at 240 kPa in 450 L water/ha. All Colorado potato beetles (C.P.B.) on plants in the two centre rows of each plot were counted pre-spray on July 13 and post spray on July 15, July 17, July 27, and on August 10.

RESULTS: The results are summarized in the tables below.

NAME AND AGENCY:
THOMPSON, L.S., J.G. STEWART, and J.E. LUND
Agriculture Canada, Research Station
Charlottetown, Prince Edward Island
C1A 7M8

CONCLUSIONS: The synthetic pyrethroids CAPTURE and FASTAC controlled C.P.B. populations early and populations remained low during the growing season. The addition of BASUDIN with a lower rate of FASTAC was as effective as FASTAC at the high rate. The insect growth regulator HOE 000522 controlled C.P.B. populations at both rates tested and when tank mixed with the fungicides DITHANE M-45 and BRAVO. BASF Lab 166801, the other insect growth regulator tested, was slow acting, but controlled populations for most of the growing season. The bacterial insecticide M-ONE controlled C.P.B. populations best at the higher rate tested. The addition of the fungicide BRAVO also lessened the effects of control with M-ONE. Tuber yields (total and market) were higher on all plots where insecticides were applied, but only those plots treated with the higher rate of CAPTURE significantly out yielded the check plots.

TREATMENT AND RATE (kg ai/ha)		MEAN NO. C.P.B. LARVAE FROM TWO CENTRE ROWS				
		Pre-Spray	1 day Post-Spray	3 days Post-Spray	2 wk Post-Spray	4 wk Post-Spray
Check		70a[1]	61 cde	112a	289a	88a
CAPTURE	.048	66a	0 e	2 b	1 c	0 b
CAPTURE	.024	95a	4 de	2 b	6 c	0 b
HOE 000522	.025	76a	69 bcd	16 b	22 c	1 b
HOE 000522	.020	58a	64 cde	26 b	19 c	1 b
HOE + DITHANE	.025+2.2L Prod.	90a	128ab	22 b	17 c	2 b
HOE + BRAVO	.025+2.4L Prod.	97a	92abc	38 b	13 c	2 b
M-ONE	6.9L Prod.	89a	22 de	5 b	70 c	11 bc
M-ONE	4.6L Prod.	87a	45 cde	22 b	166 b	10 bc
M-ONE + DITHANE	6.9L+2.2L Prod.	77a	18 de	10 b	49 c	5 c
M-ONE + BRAVO	6.9L+2.4L Prod.	69a	40 cde	19 b	191 b	38 b
FASTAC	.015	74a	3 de	1 b	0 c	0 c
FASTAC + BASUDIN	.010+0.55	63a	7 de	2 b	1 c	0 c
BASF LAB.166801	.050	105a	135a	87a	27 c	9 cb

[1]Means within a column followed by the same letter are not significantly different at P=0.05 (D.M.R.T.).

TREATMENT AND RATE (kg ai/ha)		TUBER YIELD (KGS/2 CENTRE ROWS)		% YIELD INCREASE OVER CHECK
		TOTAL	MARKETABLE	MARKETABLE
Check		44.7b[1]	40.8b	-
CAPTURE	.048	52.5a	48.8a	19.7
CAPTURE	.024	48.0ab	44.1ab	8.0
HOE 000522	.025	49.9ab	46.0ab	12.8
HOE 000522	.020	46.0ab	42.2ab	3.5
HOE + DITHANE	.025+2.2L Prod.	48.2ab	43.6ab	6.9
HOE + BRAVO	.025+2.4L Prod.	47.7ab	43.8ab	7.5
M-ONE	6.9L Prod.	47.1ab	43.8ab	7.3
M-ONE	4.6L Prod.	47.6ab	44.3ab	8.7
M-ONE + DITHANE	6.9L+2.2L Prod.	47.1ab	42.7ab	4.8
M-ONE + BRAVO	6.9L+2.4L Prod.	47.7ab	43.6ab	7.0
FASTAC	.015	50.2ab	46.6ab	14.3
FASTAC + BASUDIN	.010 + 0.55	48.7ab	45.4ab	11.4
BASF LAB. 166801	.050	50.2ab	46.8ab	14.7

[1]Means within a column followed by the same letter are not significantly different at P=0.05 (D.M.R.T.).

CROP: Potato var. Sebago

PEST: Colorado potato beetle, Leptinotarsa decemlineata (Say), Green peach aphid, Myzus persicae (Sulzer)

TITLE: EVALUATION OF INSECTICIDES FOR CONTROL OF INSECT PESTS OF POTATO, 1987

MATERIALS: KARATE 50 EC (cyhalothrin 50 g ai/L), CYMBUSH 250 EC (cypermethrin 250 g ai/L), SYS-TEM 480 EC (dimethoate 480 g ai/L)

METHODS: Plots consisted of two 6 metre rows each replicated 4 times in a completely randomized block design. Plots were treated August 7 and 18 with a small plot CO_2 pressurized sprayer equipped with cone nozzles calibrated to apply 500 litres per hectare at a pressure of 315 kPa. Small larvae and eggs were present at spraying.
Location: Fonthill, Ontario

NAME AND AGENCY:

WOERLEN, T.
Chipman, A Business Unit of C-I-L Inc.
400 Jones Road
Stoney Creek, Ontario
L8G 3Z1

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All treatments significantly reduced Colorado potato beetle larvae populations compared to the untreated check. KARATE 50 EC at a rate of 0.0125 kg ai/ha provided the highest level of control during the time period tested. All treatments significantly reduced the population of Green peach aphids compared to the untreated check. KARATE 50 EC at rate of 0.0125 kg ai/ha and KARATE 50 EC in tankmix with SYS-TEM 480 EC significantly reduced green peach aphid populations compared to CYMBUSH 250 EC at rate of 0.10 kg ai/ha.

TREATMENT	RATE (kg ai/ha)	COLORADO POTATO BEETLE POPULATION[1]				GREEN PEACH APHID POPULATION[4]
		Aug 14	Aug 17	Aug 19	Average	Aug 14
KARATE 50 EC	0.0100	9.3 a[3]	24.5 ab	5.5 ab	13.1 (69)[2]	11.6 ab[5] (82)[2]
KARATE 50 EC	0.0125	7.5 a	10.5 a	4.0 a	7.3 (83)	5.8 a (91)
CYMBUSH 250 EC	0.1000	10.5 a	33.0 b	14.0 b	19.2 (55)	15.5 b (76)
KARATE 50 EC + SYS-TEM 480 EC	0.0100 + 0.2600	8.8 a	24.3 ab	5.0 ab	12.7 (70)	5.2 a (92)
Check	-	28.0 b	53.5 c	45.5 c	42.3	63.4 c

1. Average number of Colorado potato beetle larvae per 20 haulms per plot.
2. Percent control relative to the untreated check.
3. All treatments means with the same letter are not significantly different at the 5% level (t-test).
4. Average number of leaflets infested with aphids per 100 leaflets counted per plot.
5. All treatments means with the same letter are not significantly different at the 5% level (t-test, logarithm transformed, C = 1.0).

CROP: Potatoes, cv. Russet Burbank

PEST: Green peach aphid, Myzus persicae Sulz.

TITLE: EVALUATION OF GRANULAR SYSTEMIC INSECTICIDES IN SANDY SOIL AGAINST GREEN PEACH APHIDS ON POTATO

NAME AND AGENCY:
MACKENZIE, J.R. and R.S. VERNON
Agriculture Canada, Research Station
Vancouver, British Columbia V6T 1X2

MATERIALS: COUNTER 15G (terbufos); DI-SYSTON 15G (disulfoton); FURADAN 10G (carbofuran); LANCE 10G and 15G (cloethocarb); TEMIK 15G (aldicarb); THIMET 15G (phorate).

METHODS: Potato plots were established in a sandy soil at the Abbotsford field sub-station on 20 May, 1987. Treatment rows were 1.5 m long, with potatoes seeded 30 cm apart and 15 cm deep. Each treatment contained 2 rates in rows paired 1 m apart, with 2 m between adjacent treatments. Treatments were replicated 4 times in a randomized split plot design. At seeding, granular insecticides, all systemics, were applied with hand held shakers to 20 cm wide bands along-side seed pieces in the opened furrows. All plots were hilled on 29 May. Aphids were introduced to plants 36 and again 48 days after seeding by placing 10, lab-reared apterae in a gauze sock, enclosing a potato leaf in the sock right back to the stem, and tying it snugly around the leaf petiole next to the stem. One compound leaf located midway up a plant was chosen in each treatment plot. Aphids were allowed to colonize and reproduce on the host leaf for 6 days after which time the entire leaf with its sock was snipped off. Leaves in socks were taken immediately to the lab and the number of living aphids counted.

RESULTS: The results are summarized in the table.

CONCLUSIONS: On day 35, although not significant, only TEMIK applied at the recommended rate (2.0 g ai/10 m row) and half that rate, and DI-SYSTON at 3.0 g ai/10 m row, provided noticable control in sandy soil. After 48 days however, differences between treatments were less pronounced.

TREATMENT	RATE (g ai/10m)	TOTAL APHID COUNTS[1] Day 35	Day 48
COUNTER 15G	1.0	593 ab[3]	220 NS
	2.0	871 ab	243
DI-SYSTON 15G	2.0	542 ab	196
	3.0	93 ab	102
FURADAN 10G	1.0	403 ab	216
	2.0	334 ab	181
LANCE 10G	2.0	793 ab	126
	4.0	245 ab	214
LANCE 15G	2.0	888 b	97
	4.0	312 ab	69
TEMIK 15G	1.0	44 ab	79
	2.0	15 a	103
THIMET 15G	2.1	154 ab	231
	3.2	370 ab	230
Control	-	808 ab	122

[1]Number of aphids found alive on host leaf.
[2]Number of days after seeding when aphids were introduced to host.
[3]Values followed by the same letter are not significantly different at the 5% level according to Duncan's multiple range test. NS: Values not significantly different at the 5% level.

CROP: Potatoes, cv. Russet Burbank

PEST: Green peach aphid, Myzus persicae Sulz.

TITLE: EVALUATION OF TEMIK AND THIMET IN MUCK SOIL AGAINST GREEN PEACH APHIDS ON POTATO

NAME AND AGENCY:
MACKENZIE, J.R. and R.S. VERNON
Agriculture Canada, Research Station
Vancouver, British Columbia V6T 1X2

MATERIALS: TEMIK 15G (aldicarb); THIMET 15G (phorate).

METHODS: Potato plots were established in a muck soil near Cloverdale in Surrey, B.C. on 21 May, 1987. Treatment rows were 1.5 m long, with potatoes seeded 30 cm apart and 15 cm deep. Treatments were replicated 4 times in a randomized complete block design. At seeding, the granular insecticides, both systemics, were applied with hand held shakers to 20 cm wide bands alongside seed pieces in the opened furrows. Aphids were introduced to plants 34 and again 61 days after seeding by placing 10, lab-reared apterae in a gauze sock, enclosing a potato leaf in the sock right back to the stem, and tying it snugly around the leaf petiole next to the stem. One compound leaf located midway up a plant, was chosen in each treatment plot. Aphids were allowed to colonize and reproduce on the host leaf for 6 days after which time the entire leaf with its sock was snipped off. Leaves in socks were taken immediately to the lab and the number of living aphids counted.

RESULTS: The results are summarized in the table.

CONCLUSIONS: In muck soil, only TEMIK applied at 1.0 and 2.0 g ai/10 m row provided significantly better control 34 and 61 days after seeding.

TREATMENT	RATE (g ai/10m)	TOTAL APHID COUNTS[1] Day 34[2]	Day 61
TEMIK 15G	0.5	741 bc[3]	169 abc
	1.0	191 ab	87 a
	2.0	46 a	151 ab
THIMET 15G	1.0	1249 c	196 bcd
	2.1	1305 c	270 d
	3.2	1218 c	191 bcd
Control	-	1413 c	263 cd

[1]Number of aphids found alive on host leaf.
[2]Number of days after seeding when aphids were introduced to host.
[3]Values followed by the same letter are not significantly different at the 5% level according to Duncan's multiple range test.

CROP: Potatoes, cv. Russet Burbank

PEST: Green peach aphid, Myzus persicae Sulz.

TITLE: EVALUATION OF TEMIK AND THIMET IN CLAY SOIL AGAINST GREEN PEACH APHIDS ON POTATO

NAME AND AGENCY:
MACKENZIE, J.R. and R.S. VERNON
Agriculture Canada, Research Station
Vancouver, British Columbia V6T 1X2

MATERIALS: TEMIK 15G (aldicarb); THIMET 15G (phorate).

METHODS: Potato plots were established in a clay soil in Delta, B.C. on 25 May, 1987. Treatment rows were 1.5 m long, with potatoes seeded 30 cm apart and 15 cm deep. Treatments were replicated 4 times in a randomized complete block design. At seeding, the granular insecticides, both systemics, were applied with hand held shakers to 20 cm wide bands alongside seed pieces in the opened furrows. Aphids were introduced to plants 32 and again 57 days after seeding by placing 10, lab-reared apterae in a gauze sock, enclosing a potato leaf in the sock right back to the stem, and tying it snugly around the leaf petiole next to the stem. One compound leaf located midway up a plant, was chosen in each treatment plot. Aphids were allowed to colonize and reproduce on the host leaf for six days after which time the entire leaf with its sock was snipped off. Leaves in socks were taken immediately to the lab and the number of living aphids counted.

RESULTS: The results are summarized in the table.

CONCLUSIONS: Thirty-two days after seeding, significantly fewer aphids were found alive on leaves from plots treated with either TEMIK or THIMET, and numbers were lower in TEMIK treated plots than in THIMET plots. At 57 days after seeding, no significant differences between treatments were found, although aphids were again fewest in plots treated with TEMIK at 1.0 and 2.0 g ai/10 m row.

TREATMENT	RATE (g ai/10m)	TOTAL APHID COUNTS[1] Day 32[2]	Day 57
TEMIK 15G	0.5	7 a[3]	118 NS
	1.0	7 a	73
	2.0	2 a	57
THIMET 15G	1.0	391 a	188
	2.1	78 a	214
	3.2	79 a	128
Control	-	1085 b	202

[1]Number of aphids found alive on host leaf.
[2]Number of days after seeding when aphids were introduced to host.
[3]Values followed by the same letter are not significantly different at the 5% level according to Duncan's multiple range test. NS: Values not significantly different at the 5% level.

CROP: Potato var. Sebago

PEST: Green Peach Aphid, *Myzus persicae* (Sulzer), Colorado Potato Beetle, *Leptinotarsa decemlineata* (Say)

TITLE: EVALUATION OF INSECTICIDES FOR THE CONTROL OF INSECT PESTS OF POTATO, 1987

MATERIALS: KARATE 50 EC (PP 321 50 g/L), SYS-TEM 480 EC (dimethoate 480 g/L), PIRIMOR 50 WP (pirimicarb 50%)

METHODS: Plots consisted of 2 rows, each 5 meters long and were replicated 4 times in a randomized block design. Treatments were applied August 6 with a CO_2 sprayer calibrated to apply 500 L/ha at a pressure of 315 kPa. Plots were assessed by inspecting for the presence of insects.
Location: Fonthill, Ontario

NAME AND AGENCY:

SMITH, D.B.
Chipman, A Business Unit of C-I-L Inc.
400 Jones Road
Stoney Creek, Ontario
L8G 3Z1

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Numbers of aphids remained low with no significant differences observed between treatments. Knockdown of Colorado potato beetles was significantly improved by adding SYS-TEM at 0.26 kg ai/ha to KARATE at 0.01 kg ai/ha. By 4 days after treatment this difference was no longer observed and KARATE alone was equal to the KARATE + SYS-TEM tank mix treatments. KARATE provided significantly better control of Colorado potato beetle than did SYS-TEM with no control observed in SYS-TEM treated plots by 7 days after treatment.

TREATMENT	RATE (kg ai/ha)	GREEN PEACH APHID[1] Aug 7 (1 day)	Aug 10 (4 days)	Aug 13 (7 days)	COLORADO POTATO BEETLE[2] Aug 7 (1 day)	Aug 10 (4 days)	Aug 13 (7 days)
KARATE 50 EC	0.01	1.9 a*	0.6 a	0.9 a	43.7 bc (75)[3]	1.9 a (99)	7.6 a (98)
SYS-TEM 480 EC	0.26	2.6 a	0.9 a	0.9 a	149.2 de (15)	76.1 bc (74)	413.8 b (0)
KARATE 50 EC + SYS-TEM 480 EC	0.01 + 0.13	0.8 a	0.3 a	0.2 a	30.5 ab (83)	18.7 ab (94)	28.1 a (93)
KARATE 50 EC + SYS-TEM 480 EC	0.01 + 0.26	2.1 a	2.0 a	0.9 a	5.9 a (97)	6.7 a (98)	7.6 a (98)
PIRIMOR	0.25	0.0 a	0.0 a	0.6 a	81.3 cd (54)	133.1 cd (54)	255.1 b (38)
check	-	0.6 a	1.0 a	0.3 a	175.8 e -	291.6 d -	413.0 b -

1. Average number of leaflets infested per 20 haulms inspected per plot.
2. Average number of larvae per 2 plants inspected.
3. Percent control relative to numbers in the check plot.

* Treatment means in the same column with no letter in common are significantly different at the 5% level (t-test).

CROP: Potato var. Superior

PEST: Potato aphid, Macrosiphum euphorbiae(Thos.)

TITLE: EVALUATION OF FOLIAR INSECTICIDES FOR THE CONTROL OF POTATO APHIDS, 1987

MATERIALS: KARATE 50 EC (PP 321 50 g/L), CYMBUSH 250 EC (cypermethrin 250 g/L), BELMARK (fenvalerate 300 g/L)

METHODS: Treatments were applied to 3 row x 6 m plots using a hand-held boom sprayer equipped with 4 x 12 TeeJet hollow cone nozzles. A spray volume of 550 L/ha was applied at 1375 kPa of pressure. Treatments were replicated 4 times and arranged in a randomized complete block design. The potatoes were treated August 12 and 20, and assessed on August 17, 20, 21 and 25 by counting the number of leaflets on 25 leaves selected at random throughout the plot.
Location: St. Beatrix, Quebec

NAME AND AGENCY:

LETENDRE, G.
Chipman, A Business Unit of C-I-L Inc.
623 Le Breton
Longueuil, Quebec
J4G 1R9

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All treatments significantly reduced the number of leaflets infested with aphids 24 hours after treatment. KARATE at 0.0125 kg and BELMARK at 0.07 kg ai/ha gave significantly better control of aphids 5 and 8 days after treatment.

TREATMENT	RATE (g ai /ha)	% TOTAL LEAFLETS W/APHIDS[1]				
		13/08	17/08	20/08	21/08	25/08
KARATE	0.0100	5.0 a (84)[2]	23.2 b (55)	33.5 b (0)	8.9 a (71)	21.8 bc (20)
KARATE	0.0125	2.7 a (91)	3.3 a (94)	5.4 a (84)	5.9 a (81)	3.5 a (87)
CYMBUSH	0.0350	3.1 a (90)	13.9 ab (73)	28.2 b (16)	11.9 a (61)	9.0 ab (67)
BELMARK	0.0700	2.5 a (92)	4.7 a (91)	12.9 ab (62)	2.8 a (91)	2.3 a (92)
Check	-	30.9 b -	51.3 c -	33.7 b -	30.8 b -	27.1 c -

1. Mean percent number of leaves with aphids per treatment. Values in the same column followed by the same letter are not significantly different at the 5% level. Values are arc-sin transformed, constant = 100.
2. Percent control compared to checks.

CROP: Potato var. Kennebec

PEST: Potato Flea Beetle, Epitrix cucumeris (Harris), Tarnished Plant Bug, Lygus lineolaris (P. de B.), Potato Leafhopper, Empoasca fabae (Harris), Green Peach Aphid, Myzus persicae (Sulzer)

TITLE: EVALUATION OF INSECTICIDES FOR THE CONTROL OF INSECT PESTS OF POTATO, 1987

MATERIALS: KARATE 50 EC (PP 321 50 g/L), CYMBUSH 250 EC (cypermethrin 250 g/L), SYS-TEM 480 EC (dimethoate 480 g/L)

METHODS: Plots consisted of 3 rows, each 5 meters long and were replicated 4 times in a completely randomized block design. The trial was seeded May 20. Treatments were applied August 6 with a CO_2 sprayer calibrated to deliver 500 L/ha at a pressure of 315 kPa. The middle row of each plot was assessed by inspecting plants for insects and by counting insects captured in a standard sweep net. Location: Burlington, Ontario. (DAT=Days after treatment)

NAME AND AGENCY:

PALMER, D.P.,
SMITH, D.B.
Chipman, A Business Unit of C-I-L Inc.
400 Jones Road
Stoney Creek, Ontario
L8G 3Z1

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All insecticide treatments significantly reduced numbers of potato flea beetles, green peach aphids, potato leafhoppers and tarnished plant bugs. No significant differences were observed between the insecticide treatments, however, KARATE treated plots had fewer aphids than CYMBUSH treated plots. No improvement in control was observed with the addition of SYS-TEM to KARATE. Yield was significantly improved by all treatments.

TREATMENT	RATE (kg ai/ha)	POTATO FLEA BEETLE[1] Aug 7 (1 DAT)	Aug 10 (4 DAT)	Aug 13 (7 DAT)	GREEN PEACH APHID[2] Aug 7 (1 DAT)	Aug 10 (4 DAT)	Aug 13 (7 DAT)
KARATE	0.0100	0.2 a* (93)[4]	0.0 a (100)	1.2 a (80)	0.0 a (100)	0.9 a	0.4 a
KARATE	0.0125	0.0 a (100)	0.4 a (94)	0.5 a (92)	0.0 a (100)	0.7 a	0.5 a
CYMBUSH	0.0350	0.0 a (100)	0.2 a (97)	0.0 a (100)	0.5 a (85)	2.3 a	0.4 a
KARATE + SYS-TEM	0.0100 + 0.2600	0.2 a (93)	0.6 a (92)	0.0 a (100)	0.2 a (94)	0.7 a	0.9 a
Check	-	2.9 b -	7.5 b -	6.1 b -	3.1 b -	0.8 a	1.1 a

TREATMENT	RATE (kg ai/ha)	POTATO LEAFHOPPER[1] Aug 7 (1 DAT)	Aug 10 (4 DAT)	Aug 13 (7 DAT)	TARNISHED PLANT BUG[1] Aug 7 (1 DAT)	Aug 10 (4 DAT)	Aug 13 (7 DAT)	FRESH WEIGHT[3] TUBERS (t/ha) Aug 20
KARATE	0.0100	0.7 a (85)	0.3 a (97)	0.2 a (97)	0.0 a	1.2 a (78)	0.2 a	27.6 a
KARATE	0.0125	0.3 a (93)	0.3 a (97)	0.2 a (97)	0.0 a	0.7 a (88)	0.9 a	26.7 a
CYMBUSH	0.0350	1.1 a (77)	0.2 a (98)	0.3 a (95)	0.4 a	0.0 a (100)	0.6 a	29.2 a
KARATE + SYS-TEM	0.0100 + 0.2600	0.6 a (87)	0.5 a (96)	0.0 a (100)	0.2 a	0.6 a (89)	0.4 a	29.2 a
Check	-	4.7 b -	11.3 b -	7.0 b -	1.1 a	5.6 b -	2.0 a	21.7 b

1. Mean number of insects per 5 plot sweeps.
2. Mean number of leaflets infested per 20 haulms per plot.
3. Estimated yield in tonnes per hectare (plot size = 3 rows x 5 m).
4. Percent control relative to numbers in the check plots.

* Treatment means in the same column followed by the same letter are not significantly different at the 5% level (t-test).

CROP: Potato, *Solanum tuberosum*, cv. Kennebec

PEST: Tarnished plant bug *Lygus lineolaris* (P.deB.)

TITLE: CONTROL OF TARNISHED PLANT BUG WITH FOLIAR-APPLIED INSECTICIDES ON POTATOES

NAME AND AGENCY:
SEARS, M.K. and MCGRAW, R.R.
Department of Environmental Biology
University of Guelph
Guelph, Ontario N1G 2W1

MATERIALS: DECIS 2.5 EC (deltamethrin), DECIS 5 F (deltamethrin), CAPTURE 240 EC (bifenthrin), ZOLONE 500 F (phosalone), and KARATE 50 EC (PP 321).

METHODS: Potatoes were seeded on May 13 in plots 4 rows by 15 m long. Rows were spaced at 0.9 m and plots were separated by 3 m spray lanes. Populations of tarnished plant bug adults and nymphs were monitored each week by taking 10 samples with a standard, 90 cm diam sweep net from each plot. Insecticides were applied with a tractor-mounted, 4-row boom sprayer that delivered 800 L/ha at 450 kPa. Treatments were arranged in a randomized complete block design. All treatments were initially applied on June 29. Application dates of treatments applied subsequently are indicated by an asterisk following the values on the date just prior to the date of application (Table 1).

RESULTS: See Table 1.

CONCLUSIONS: KARATE and all three rates of CAPTURE gave excellent control of the plant bug. DECIS was moderately successful controlling the adult but did not show good control of the nymphs. ZOLONE did not control adult or nymph.

TABLE 1. Mean number of tarnished plant bug adults and nymphs per 10 sweep net samples in potatoes, cv. Kennebec, treated with foliar insecticides, 1987.

		Mean[1] number of insects per 10 sweeps					
		TARNISHED PLANT BUG ADULTS (A) AND NYMPHS (N)					
	Rate	July 30		Aug 6		Aug 13	
Material	(g a.i./ha)	A	N	A	N	A	N
DECIS 2.5	5	57.8abc	8.5cde*	5.8fg	1.0cd*	10.5abcde	0.8cd
DECIS 5	5	38.8bcd	18.3bcde	7.8fg	6.3abcd*	4.3cde	3.5abcd
CAPTURE	24	26.3cd	1.0f	3.0g	0.0d*	0.3e	0.0d
CAPTURE	36	47.3abc	8.3def*	2.0g	0.0d	1.8de	0.0d
CAPTURE	48	51.5abc	8.3def*	15.5cdefg	2.8bcd*	1.3de	0.0d
ZOLONE	625	80.5a	34.8a*	26.8abcde	7.8ab*	9.5bcde	6.5ab
ZOLONE	875	70.8a	21.5abcde*	16.3bcdefg	5.5abcd*	9.3bcde	5.5abcd
KARATE	10	12.0d	1.0f	12.0defg	0.5cd*	0.8de	0.0d
CHECK	-	62.8abc	24.3ab	33.8abc	7.5ab	18.5ab	4.0abcd

1. Means in columns followed by the same letter are not significantly different at P = 0.05 (Duncan's New Multiple Range Test).

* Treatment applied following this date and prior to next observation.

CROP: Potatoes, var. Russet Burbank

PEST: Tuber flea beetle, Epitrix tuberis Gent.

TITLE: EVALUATION OF FOLIAR-APPLIED INSECTICIDES AGAINST THE TUBER FLEA BEETLE ON POTATOES - STUDY II

NAME AND AGENCY:
MACKENZIE, J.R. AND R.S. VERNON
Agriculture Canada, Research Station
Vancouver, British Columbia V6T 1X2

MATERIALS: BAYTHROID 2 C (cyfluthrin); CAPTURE 2 EC (bifenthrin); DECIS 2.5 EC and 5.0 F (deltamethrin); DYFONATE MS (fonofos); KARATE 50 EC and 100 F (cyhalothrin); LORSBAN 4 E (chlorpyrifos); MONITOR 4.8 L (methamidophos); POUNCE EC (permethrin).

METHODS: Potatoes were seeded at the Abbotsford substation on 14 July, 1987. Plants were spaced 30 cm apart in rows 4 m long with 1.5 m wide strips left unplanted between end-to-end rows. To minimize spray drift, adjacent rows were spaced 3 m apart and a 60 cm high black plastic barricade was erected between them. Treatments were single rows and replicated 4 times in a randomized block design. Two separate experiments were conducted simultaneously (see Tables 1 and 2 respectively). Three consecutive plants were arbitrarily chosen and marked within each row. On 4 August when plants were about 15 cm high and wide, five first 'summer' generation beetles were released on each of the three plants. In the early morning of 5 August, spray treatments were applied with a hand pushed CO_2 pressurized sprayer fitted with a single, type D4 hollow cone nozzel, at 552 kPa to deliver 600 L water/ha. Treatments were assessed by trained scouts who visually inspected the 3 marked plants for 10 sec./plant 2 days after spray application, 12 sec./plant 5 and 7 days after application, and 15 sec./plant 9 days after application. Twelve days after sprays were applied, 5 minutes was spent on each row and all beetles seen were collected in aspirators and counted.

RESULTS: The results of the two experiments are summarized in the table.

CONCLUSIONS: The synthetic pyrethroids KARATE EC and F, POUNCE, and BAYTHROID provided excellent control 7 days after application. Control was still apparent in BAYTHROID and CAPTURE treated plots even 9 days after application. The organophosphates, DYFONATE, LORSBAN, and MONITOR were generally less effective than the synthetic pyrethroids. As in Study I (see this issue PRR), more beetles were found in the control plots 2 days after spraying than were initially released; again, probably a result of natural infestation.

TABLE 1; Experiment 1

TREATMENT	RATE (g ai/ha)	TOTAL VISUAL BEETLE COUNTS 2[1]	5	7	9	12
*DECIS 5.0 F	7.5	1 a[2]	0 a	5 b	12 ab	48 ab
*DECIS 2.5 EC	7.5	2 a	0 a	2 ab	26 bc	72 b
*KARATE 100 F	10.0	3 a	0 a	0 a	6 a	28 a
*KARATE 50 EC	10.0	0 a	0 a	0 a	8 a	36 a
*POUNCE EC	224.0	0 a	0 a	0 a	9 ab	37 a
Control 1	-	28 b	22 b	38 b	44 c	122 c

TABLE 2; Experiment 2

TREATMENT	RATE (g ai/ha)	TOTAL VISUAL BEETLE COUNTS 2[1]	5	7	9	12
*BAYTHROID 2 C	50	1 a[2]	0 a	0 a	2 a	73 a
*CAPTURE 2 EC	112	0 a	1 a	3 a	2 a	124 b
DYFONATE MS	300	7 a	14 b	31 b	51 b	148 b
LORSBAN 4 E	480	6 a	3 a	38 b	50 b	167 b
MONITOR 4.8 L	1,080	7 a	15 b	42 b	38 b	145 b
Control 2	-	28 b	18 b	32 b	34 b	123 b

[1]Days after treatment application.
[2]Values followed by the same letter are not significantly different at the 5% level according to Duncan's multiple range test. The data were transformed (square root (x + 0.5)) during analysis of variance.
*Synthetic pyrethoid.

CROP: Potatoes, cv. Russet Burbank

PEST: Tuber flea beetle, Epitrix tuberis Gent.

TITLE: EVALUATION OF GRANULAR INSECTICIDES AGAINST OVERWINTERED TUBER FLEA BEETLE ADULTS AND FIRST GENERATION LARVAE IN MUCK SOIL.

MATERIALS: DYFONATE 10G (fonofos); TEMIK 15G (aldicarb); THIMET 15G (phorate); PARATHION 8EC.

METHODS: Potato plots were established in muck soil near Cloverdale in Surrey, B.C. on 21 May, 1987. Treatment rows were 1.5 m long and 2 m apart, with potatoes seeded at 30 cm spacings, 15 cm deep. Treatments were replicated 4 times in a randomized complete block design. At seeding, granular insecticides were applied with hand held shakers to 20 cm wide bands alongside seed pieces in the opened furrows. On 17 June, 27 days after seeding, 5 'overwintered' generation tuber flea beetles were released on each of the 5 plants in each plot and allowed to feed and oviposit. To discourage beetle immigration or emigration, the field and treatments were enclosed in 1 m high black plastic barricades on 5 June. Six days after release, plants in each treatment row were visually inspected for beetles by trained scouts for 12 sec./plant to determine feeding induced adult mortality. On 24 June, all plants were sprayed with PARATHION to confine the oviposition period to seven days. On 22 July, three consecutive plants in each treatment row were cut off at ground level, removed, and the exposed area covered with emergence cages to quantify the emergence of the subsequent 'first' adult generation.

NAME AND AGENCY:
VERNON, R.S. and J.R. MACKENZIE
Agriculture Canada, Research Station
Vancouver, British Columbia V6T 1X2

RESULTS: The results are summarized in the table.

CONCLUSIONS: TEMIK applied at the recommended rate, 2.0 g ai/10 m row provided the best control of spring generation beetles feeding on potato foliage after six days. THIMET applied at the low and high rates in the recommended range i.e. 2.1 and 3.2 g ai/10 m, did not reduce numbers of leaf feeding beetles sufficiently before considerable oviposition could occur, as evidenced by total beetle emergence. Neither THIMET nor TEMIK provided adequate control when applied at less than recommended rates. DYFONATE provided no control whatsoever.

TREATMENT	RATE (g ai/10 m)	VISUAL BEETLE COUNT[1]	TOTAL BEETLE EMERGENCE (JUL., AUG.) 28 -30	31 -2	3 -5	6 -8	9 -11	TOTAL
DYFONATE 10G	2.0	36 c[2]	41	244	538	278	89	1190 c
*TEMIK 15G	0.5	6 a	13	108	161	120	18	420 ab
	1.0	10 ab	12	93	157	93	17	372 ab
	2.0	2 a	10	16	43	33	2	104 a
*THIMET 15G	1.0	16 b	22	137	292	133	33	617 b
	2.1	4 a	33	128	35	12	10	218 ab
	3.2	6 a	28	63	90	26	13	220 ab
Control	-	32 c	30	246	410	267	60	1013 c

[1]6 days post-release (23 June).
[2]Numbers followed by the same letter are not significantly different at the 5% level according to Duncan's multiple range test.
*Insecticide with systemic properties.

CROP: Potatoes, cv. Russet Burbank

PEST: Tuber flea beetle, Epitrix tuberis Gent.

TITLE: EVALUATION OF GRANULAR INSECTICIDES AGAINST FIRST GENERATION TUBER FLEA BEETLE ADULTS AND SECOND GENERATION LARVAE IN SANDY SOIL.

NAME AND AGENCY:
MACKENZIE, J.R. and R.S. VERNON
Agriculture Canada, Research Station
Vancouver, British Columbia V6T 1X2

MATERIALS: COUNTER 15G (terbufos); DI-SYSTON 15G (disulfoton); DYFONATE 10G (fonofos); FURADAN 10G (carbofuran); LANCE 10G and 15G (cloethocarb); LORSBAN 15G (chlorpyrifos); TEMIK 15G (aldicarb); THIMET 15G (phorate).

METHODS: Potato plots were established in a sandy-clay loam soil at the Abbotsford field sub-station on 20 May, 1987. Treatment rows were 1.5 m long, with potatoes seeded 30 cm apart and 15 cm deep. Each treatment contained 2 rates in rows paired 1 m apart, with 2 m between adjacent treatments. Treatments were replicated 4 times in a randomized split plot design. At seeding, granular insecticides were applied with hand held shakers to 20 cm wide bands alongside seed pieces in the opened furrows. All plots were hilled on 29 May. On 15 July, 56 days after seeding, five first (summer) generation tuber flea beetles were released on each of the 5 plants/plot and allowed to feed and oviposit. To discourage beetle immigration or emigration, the field and treatments were enclosed in 1 m high black plastic barricades on 4 June. On 18 August, 34 days after beetle release, three consecutive plants in each treatment row were cut off at ground level, removed, and the exposed area covered with emergence cages to quantify the emergence of the subsequent 'second' adult generation.

RESULTS: The results are summarized in the table.

CONCLUSIONS: The emergence of second (late summer) generation tuber flea beetles, although not significant, was substantially lower in plots treated with the high rate of COUNTER, or with both rates of THIMET and LANCE 10G. All three of these insecticides are systemic. Although the other systemic products tested, FURADAN, TEMIK, DI-SYSTON, and LANCE 15G, provided good control 28 days after seeding in another study, control here was poor 56 days after seeding. Neither LORSBAN nor DYFONATE, both contact insecticides, provided noticeable control.

		TOTAL BEETLE EMERGENCE (AUG., SEPT.)							
TREATMENT	RATE (g ai/10 m)	19 -21	22 -24	25 -27	28 -30	31 -2	3 -5	6 -8	TOTAL
*COUNTER 15G	1.0	1	0	15	18	16	9	6	65 ab[1]
	2.0	1	0	0	1	5	4	5	16 a
*DI-SYSTON 15G	2.0	5	3	13	31	25	16	13	106 b
	3.0	1	0	3	14	21	16	3	58 ab
DYFONATE 10G	1.0	4	5	16	25	20	7	6	83 ab
	2.0	7	7	8	9	7	4	5	47 ab
*FURADAN 10G	1.0	3	3	11	12	11	15	11	66 ab
	2.0	1	5	7	6	5	8	11	43 ab
*LANCE 10G	2.0	1	0	0	1	1	0	2	5 a
	4.0	0	0	1	3	2	6	9	21 a
*LANCE 15G	2.0	3	7	5	2	9	6	9	41 ab
	4.0	7	4	11	13	8	8	6	57 ab
LORSBAN 15G	1.0	5	7	13	13	16	5	5	64 ab
	2.0	2	2	2	18	11	8	2	45 ab
*TEMIK 15G	1.0	14	5	8	6	12	5	10	60 ab
	2.0	3	5	2	6	6	10	17	49 ab
*THIMET 15G	2.1	0	0	0	0	1	1	1	3 a
	3.2	0	0	1	1	0	0	0	2 a
Control	-	7	3	5	4	7	5	1	32 ab
	-	20	12	3	4	9	7	5	60 ab

[1]Numbers followed by the same letter are not significantly different at the 5% level according to Duncan's multiple range test.
*Insecticide with systemic properties.

CROP: Potatoes, cv. Russet Burbank

PEST: Tuber flea beetle, Epitrix tuberis Gent.

TITLE: EVALUATION OF GRANULAR INSECTICIDES AGAINST OVERWINTERED TUBER FLEA BEETLE ADULTS AND FIRST GENERATION LARVAE IN CLAY SOIL.

MATERIALS: DYFONATE 10G (fonofos); TEMIK 15G (aldicarb); THIMET 15G (phorate); PARATHION 8EC

METHODS: Potato plots were established in a clay soil at Delta, B.C. on 25 May, 1987. Treatment rows were 1.5 m long and 2 m apart, with potatoes seeded at 30 cm spacings, 15 cm deep. Treatments were replicated 4 times in a randomized complete block design. At seeding, granular insecticides were applied with hand held shakers to 20 cm wide bands alongside seed pieces in the opened furrows. On 22 June, 28 days after seeding, 5 'overwintered' generation tuber flea beetles were released on each plant and allowed to feed and oviposit. To discourage beetle immigration or emigration, the field and treatments were enclosed in 1 m high black plastic barricades prior to beetle release. Four days after release, plants in each treatment row were visually inspected for beetles by trained scouts for 12 sec./plant to determine feeding induced adult mortality. On 29 June all plants were sprayed with PARATHION to confine the oviposition period to seven days. On 28 July, three consecutive plants in each treatment row were cut off at ground level, removed, and the exposed area covered with emergence cages to quantify the emergence of the subsequent 'first' adult generation.

NAME AND AGENCY:
VERNON, R.S. and J.R. MACKENZIE
Agriculture Canada, Research Station
Vancouver, British Columbia V6T 1X2

RESULTS: The results are summarized in the table.

CONCLUSIONS: Both TEMIK and THIMET caused almost complete mortality of spring generation beetles feeding on potato foliage after 4 days. Even TEMIK applied at one quarter the recommended rate of 2.0 g ai/10 m row, and THIMET at one half the low rate of 2.1 g ai/10 m row in the recommended range, resulted in significant control of beetles feeding on the foliage and a reduction in emergence of subsequent first generation beetles. DYFONATE failed to provide control.

			TOTAL BEETLE EMERGENCE (JUL., AUG.)					
TREATMENT	RATE (g ai/10 m)	TOTAL VISUAL BEETLE COUNT[1]	30 -2	3 -5	6 -8	9 -11	12 -14	TOTAL
DYFONATE	2.0	41 b[2]	144	103	39	14	4	304 b
*TEMIK	0.5	0 a	19	8	3	1	4	35 a
	1.0	0 a	7	2	0	2	4	15 a
	2.0	0 a	3	1	0	2	0	6 a
*THIMET	1.0	1 a	17	10	1	0	1	29 a
	2.1	0 a	29	4	4	7	6	50 a
	3.2	0 a	11	1	2	3	0	17 a
Control	-	43 b	109	129	74	18	10	340 b

[1]4 days post-release (26 June).
[2]Numbers followed by the same letter are not significantly different at the 5% level according to Duncan's multiple range test.
*Insecticide with systemic properties.

CROP: Potatoes, cv. Russet Burbank

PEST: Tuber flea beetle, Epitrix tuberis Gent.

TITLE: EVALUATION OF GRANULAR INSECTICIDES AGAINST OVERWINTERED TUBER FLEA BEETLE ADULTS IN THREE DIFFERENT SOILS

MATERIALS: DYFONATE 10G (fonofos); TEMIK 15G (aldicarb); THIMET 15G (phorate); PARATHION 8EC.

METHODS: In 1987, field studies were established in three different soils: a sandy soil at the Abbotsford, B.C. substation; a highly organic (muck) soil near Cloverdale in Surrey, B.C.; and a clay soil in Delta, B.C. Experimental plots were set up on 20 May in Abbotsford; 21 May in Cloverdale, and 25 May in Delta. At all locations, treatment rows were 1.5 m long, with potatoes seeded 30 cm apart and 15 cm deep in rows 1 m apart. In Abbotsford, each treatment was tested at 2 rates in paired rows. Treatment row pairs were replicated 4 times in a randomized split plot design. In Cloverdale and Delta, treatments were single rows and replicated 4 times in a randomized complete block design. At seeding, granular insecticides were applied with hand held shakers to 20 cm wide bands alongside seed pieces in the opened furrows. Five 'overwintered' generation tuber flea beetles were released on each of the 5 plants/plot and allowed to feed and oviposit. In Abbotsford and Cloverdale, beetle releases were made on 17 June, and in Delta on 22 June. To discourage beetle immigration or emigration, the experimental areas at all 3 sites were enclosed in 1 m high black plastic barricades. After beetle release, plants in each treatment row were visually inspected for beetles by trained scouts. In Abbotsford, plants were inspected one day after beetle release for 10 sec./plant to determine feeding induced adult mortality. Plants were inspected again 6 days after release for 15 sec./plant. In Cloverdale, plants were inspected for 12 sec./plant on all 3 inspection dates (see Table) and in Delta for 10 sec./plant 2 days after beetle release and 12 sec./plant 4 days after release. After completion of the last visual inspection, all plants were sprayed with PARATHION to confine the oviposition period to 6 days in Abbotsford and 7 days in Cloverdale and Delta.

NAME AND AGENCY:
VERNON, R.S. and J.R. MACKENZIE
Agriculture Canada, Research Station
Vancouver, British Columbia V6T 1X2

RESULTS: The results are summarized in the table.

CONCLUSIONS: Granular TEMIK and THIMET applied to Delta (clay) and Abbotsford (sand) soils, provided significant control of foliage-feeding beetles within 2 or 1 days of release, respectively. Although significant control was achieved with TEMIK at 2.0 g ai/10 m and THIMET at 3.2 g ai/10 m 1 day post-release in Cloverdale (muck) soil, numbers of beetles were generally higher than in the other 2 locations. At the lower rates of TEMIK and THIMET applied, better control was achieved in the Delta plots after 4 days than in the Cloverdale plots after 6 days. These results indicate that TEMIK and THIMET kill feeding beetles more swiftly in clay or sandy soils than in a highly organic soil, and that lower rates of application may be adequate in the former 2 soil types. DYFONATE, a non-systemic insecticide, did not kill beetles in any of the soil types tested.

TOTAL VISUAL BEETLE COUNTS

TREATMENT	RATE (g ai/10m)	Cloverdale 1[1]	Cloverdale 2	Cloverdale 6	Delta 2	Delta 4	Abbotsford 1	Abbotsford 6
DYFONATE 10G	2.0	47 de[2]	48 d	36 d	66 c	41 b	54 d	38 b
TEMIK 15G	0.5	20 b	18 bc	6 ab	9 b	0 a	-	-
	1.0	28 bcd	18 bc	10 bc	1 ab	0 a	12 b	3 a
	2.0	8 a	3 a	2 a	3 ab	0 a	1 a	2 a
THIMET 15G	1.0	51 e	38 cd	16 c	12 b	1 a	-	-
	2.1	25 bc	9 ab	4 ab	0 a	0 a	1 a	3 a
	3.2	21 b	7 ab	6 ab	1 ab	0 a	1 a	4 a
Control	-	43 cde	41 d	32 d	48 c	43 b	54 d	39 b

[1]Days after beetle release.
[2]Values followed by the same letter are not significantly different at the 5% level according to Duncan's multiple range test. Data was transformed (square root of (x + 0.5)) during analysis of variance.

CROP: Potatoes, var. Russet Burbank

PEST: Tuber flea beetle, Epitrix tuberis Gent.

TITLE: EVALUATION OF FOLIAR-APPLIED INSECTICIDES AGAINST THE TUBER FLEA BEETLE ON POTATOES - STUDY I

NAME AND AGENCY:
MACKENZIE, J.R. and R.S. VERNON
Agriculture Canada, Research Station
Vancouver, British Columbia V6T 1X2

MATERIALS: BAYTHROID 2 C (cyfluthrin); CAPTURE 2 EC (biphenthrin); DECIS 2.5 EC and 5.0 F (deltamethrin); DYFONATE MS (fonofos); KARATE 50 EC and 100 F (cyhalothrin); LORSBAN 4 E (chlorpyrifos); MONITOR 4.8 L (methamidophos); POUNCE EC (permethrin).

METHODS: Potatoes were seeded at the Abbotsford substation on 28 May, 1987. Plants were spaced 30 cm apart in rows 4 m long with 1.5 m wide strips left unplanted between end-to-end rows. To minimize spray drift, adjacent rows were spaced 3 m apart and a 60 cm high black plastic barricade was erected between them. Treatments were single rows and replicated 4 times in a randomized block design. Two separate experiments were conducted simultaneously (see Tables 1 and 2 respectively). Three consecutive plants were arbitrarily chosen and marked within each row. On 25 June, when plants were about 15 cm high and wide, five 'overwintered' generation beetles were released on each of the three plants. In the early morning of 26 June, spray treatments were applied with a hand pushed CO_2 pressurized sprayer fitted with a single, type D4 hollow cone nozzel, at 552 kPa to deliver 600 L water/ha. Treatments were assessed by trained scouts who visually inspected the 3 marked plants for 10 sec./plant 2 and 6 days after spray application, 15 sec./plant 10 days after application, and 20 sec./plant 14 days after application.

RESULTS: The results of the two experiments are summarized in the tables.

CONCLUSIONS: In both experiments, the synthetic pyrethroids provided excellent control 6 days after application. Although the organophosphates DYFONATE, LORSBAN and MONITOR controlled beetles 2 days after application, after 6 days their efficacy had lessened. Although not significant, CAPTURE provided the best control overall, and KARATE flowable was almost as effective. More beetles were found in the control plots 2 days after spraying than were initially released, probably a result of natural infestation.

TABLE 1; Experiment 1

TREATMENT	RATE (g ai/ha)	TOTAL VISUAL BEETLE COUNTS 2[1]	6	10	14
*DECIS 5.0 F	7.5	0 a[2]	0 a	4 a	14 a
*DECIS 2.5 EC	7.5	0 a	0 a	18 b	43 b
*KARATE 100 F	10.0	0 a	0 a	1 a	10 a
*KARATE 50 EC	10.0	0 a	0 a	2 a	15 a
*POUNCE EC	224.0	0 a	0 a	3 a	16 a
Control 1	-	16 b	36 b	27 b	33 ab

TABLE 2; Experiment 2

TREATMENT	RATE (g ai/ha)	TOTAL VISUAL BEETLE COUNTS 2[1]	6	10	14
*BAYTHROID 2C	50	0 a[2]	0 a	2 ab	14 ab
*CAPTURE 2 EC	112	0 a	0 a	0 a	5 a
DYFONATE MS	300	0 a	8 b	12 bc	23 b
LORSBAN 4 E	480	0 a	4 ab	14 c	24 b
MONITOR 4.8 L	1,080	0 a	4 ab	25 c	29 b
Control 2	-	33 b	45 c	20 c	34 b

[1]Days after treatment application.
[2]Values followed by the same letter are not significantly different at the 5% level according to Duncan's multiple range test. The data were transformed (square root (x + 0.5)) during analysis of variance.
*Synthetic pyrethoid.

CROP: Potatoes, cv. Russet Burbank

PEST: Tuber flea beetle, Epitrix tuberis Gent.

TITLE: EVALUATION OF GRANULAR INSECTICIDES AGAINST OVERWINTERED TUBER FLEA BEETLE ADULTS AND FIRST GENERATION LARVAE IN SANDY SOIL

NAME AND AGENCY:
VERNON, R.S. and J.R. MACKENZIE
Agriculture Canada, Research Station
Vancouver, British Columbia V6T 1X2

MATERIALS: COUNTER 15G (terbufos); DI-SYSTON 15G (disulfoton); DYFONATE 10G (fonofos); FURADAN 10G (carbofuran); LANCE 10G and 15G (cloethocarb); LORSBAN 15G (chlorpyrifos); TEMIK 15G (aldicarb); THIMET 15G (phorate); PARATHION 8EC.

METHODS: Potato plots were established in a sandy soil at the Abbotsford field substation on 20 May, 1987. Treatment rows were 1.5 m long, with potatoes seeded 30 cm apart and 15 cm deep. Each treatment contained 2 rates in rows paired 1 m apart, with 2 m between adjacent treatments. Treatments were replicated 4 times in a randomized split plot design. At seeding, granular insecticides were applied with hand held shakers to 20 cm wide bands alongside seed pieces in the opened furrows. All plots were hilled on 29 May. On 17 June, 28 days after seeding, five 'overwintered' generation tuber flea beetles were released on each of the 5 plants/plot and allowed to feed and oviposit. To discourage beetle immigration or emigration, the field and treatments were enclosed in 1 m high black plastic barricades on 4 June. Six days after beetle release, plants in each treatment row were visually inspected for beetles by trained scouts for 15 sec./plant to determine feeding induced adult mortality. Immediately after completion of the visual inspection, all plants were sprayed with PARATHION to confine the oviposition period to six days. On 23 July three consecutive plants in each treatment row were cut off at ground level, removed, and the exposed area covered with emergence cages to quantify the emergence of the subsequent 'first' adult generation. Data gathered on 24 July was omitted from the Table due to the possibility of beetles shaken off the plants on to the soil being mistaken for emerged beetles.

RESULTS: The results are summarized in the table.

CONCLUSIONS: Only the insecticides with systemic properties gave significant control. TEMIK, THIMET, COUNTER, FURADAN, DI-SYSTON and LANCE were all successful in killing spring generation adults feeding on potato leaves. Of these systemics, the DI-SYSTON treatments resulted in the greatest emergence of summer generation beetles, however, control was still significantly better than in the check plots. Of particular interest was that FURADAN and LANCE achieved excellent control this year as compared to last. Since the 1986 trials were conducted in a field with a previous history of FURADAN use, enhanced microbial degradation is suspected of reducing the efficacy of at least FURADAN in last year's trials.

TREATMENT	RATE (g ai/10 m)	TOTAL VISUAL BEETLE COUNT[1]	TOTAL BEETLE EMERGENCE (JUL., AUG.) 25 -27	28 -30	31 -2	3 -5	6 -8	9 -11	12 -14	15 -17	TOTAL
*COUNTER 15G	1.0	1 a[2]	0	5	16	9	2	0	0	0	32 ab
	2.0	0 a	1	3	5	5	4	1	0	0	19 ab
*DI-SYSTON 15G	2.0	0 a	1	26	43	18	11	1	1	0	101 b
	3.0	0 a	0	7	22	36	14	1	1	0	81 ab
DYFONATE 10G	1.0	42 b	11	35	63	55	31	8	3	1	207 cd
	2.0	38 b	3	21	52	82	26	11	3	0	198 c
*FURADAN 10G	1.0	0 a	0	4	6	2	2	2	0	1	17 ab
	2.0	0 a	0	0	3	0	0	0	0	0	3 a
*LANCE 10G	2.0	0 a	0	0	3	0	1	0	0	0	4 a
	4.0	0 a	0	2	0	0	0	0	0	0	2 a
*LANCE 15G	2.0	0 a	1	0	2	2	2	2	0	0	9 ab
	4.0	0 a	0	2	11	6	1	1	1	0	22 ab
LORSBAN 15G	1.0	66 c	4	21	71	120	49	15	3	1	284 de
	2.0	43 b	10	23	62	121	50	18	3	3	290 de
*TEMIK 15G	1.0	3 a	9	3	5	14	9	1	5	2	48 ab
	2.0	0 a	2	1	6	6	1	1	0	0	17 ab
*THIMET 15 G	2.1	1 a	2	0	1	4	0	0	0	0	7 a
	3.2	1 a	1	0	0	0	1	0	0	0	2 a
Control	-	39 b	8	18	91	140	81	29	6	3	376 f
	-	45 bc	0	34	96	133	70	17	4	3	357 e

[1]6 days post-release (23 June).
[2]Numbers followed by the same letter are not significantly different at the 5% level according to Duncan's multiple range test.
*Insecticide with systemic properties.

CROP: Rutabaga cv. Laurentian

PEST: Cabbage maggot, Delia radicum (L.)

TITLE: EFFICACY OF DRENCH TREATMENTS OF FURADAN AND DASANIT AT DIFFERENT RATES ON EARLY SEEDED RUTABAGA

MATERIALS: Furadan (carbofuran) 480F; Dasanit (fensulfothion)

METHOD: Rutabaga was seeded 15 May in single row lots, 6 M long, 75 cm apart with a Stan-Hay precision seeder. All plots received an infurrow granular treatment of Furdan 10G applied in a 15 cm band behind the seed coulter with a Gandy applicator at a rate of 1.75 kg product per 1000 M row. Drench treatments were applied on June 25 and July 28 in a 15 cm band of coarse spray, gravity pressure, in 1700 L of water per ha. Each of the ten treatments was replicated four times in a randomized block design. Plants were harvested Sept. 2 and rated fordamage (King, K.M. and A.R. Forbes. 1954. J. Econ.Entomol. 47: 607-615). The scores, as percent-ages ofthe maxima attainable, were transformed to arcsine $\sqrt{x}$ and the means compared by Duncan s Multiple Range Test.

NAME AND AGENCY:
BRACKEN G.K.
Agriculture Canada
Research Station
WINNIPEG, Manitoba
R3T 2M9

RESULTS: Control of the cabbage maggot as indicated by damage index and the percentage of marketable roots is presented for each treatment in Table 1.

CONCLUSIONS: Drench treatments of Furadan were not effective for control of cabbage maggot even at ten times the recommended application level. Efficacy was not enhanced by delivering the treatment in greater volumes of water. Dasanit gave significant reduction in damage when applied at the recommended rate but twice this rate was required to provide control that is commercially acceptable (over 80% marketable roots).

Table 1. Mean damage index and percent marketable rutabagas given different drench treatments.

Insecticide	Rate Product L/ha	Mean damage index	Marketable roots (%)
Control	---	3.88a[1]	6
Furadan 480F	5.2[2]	3.97a	1
" "	10.4	3.88a	5
" "	10.4[3]	3.97a	2
" "	10.4[4]	4.00a	0
" "	26.0	3.95a	2
" "	52.0	3.25b	34
Dasanit 7.2EC	3.1[2]	2.01c	76
" "	6.2	1.35c	90
" "	15.5	0.11d	100

[1] Means followed by the same letter not significantly different ($P < .05$, Duncan's Multiple Range test).
[2] Recommended rate, Manitoba Insect Control Guide 1987.
[3,4] Delivered in 3400 and 8500 L of water per ha respectively.

CROP: Rutabaga, var. Kingston

PEST: Cabbage maggot, Delia radicum (L.)

TITLE: CELL PACK TREATMENT TO CONTROL CABBAGE MAGGOT ON RUTABAGA TRANSPLANTS

NAME & AGENCY:
MORRY, H.G.
PROUDFOOT, K.G.
Research Station, Agriculture Canada, P. O. Box 7098, St. John's, Nfld. A1E 3Y3

MATERIALS: BIRLANE (Chlorfenvinphos) 25 W.P.
DASANIT (fensulfothion) 720 E.C.

METHODS: Four insecticidal treatments and a control, replicated four times in a randomized block design, were established in the field at Wooddale, Central Newfoundland, on June 1 and 2, and at St. John's on June 9. Each treatment consisted of one row 10 meters long and contained 60 rutabaga plants; 114 kg of 8-16-8B had been applied to each plot and rotovated in prior to planting.

Rutabaga plants were grown in soil packs as follows: Standard trays containing 48 cells were filled with Pro-mix and on April 28 and 29 two seeds were placed in each cell. After germination, seedlings were thinned to a single plant/cell, treated with the fungicides TERRACHLOR and CAPTAN and grown in the greenhouse until transplanting. Six days before field planting, 20 ml of a solution of one of the following insecticide treatments were syringed around the stem of each seedling - 2.0 ml of DASANIT 720 EC in 1000 ml of water or 1.0 gm of BIRLANE 25 WP in 1000 ml of water. Half the plants in each of the insecticide treatments were given a second application of either DASANIT or BIRLANE, at the same rate as above, six weeks after transplanting to the field.

Plant mortality counts were taken at Wooddale on July 13 and at harvest on October 23 and 24, and at St. John's on June 24 and again at harvest on September 30 - October 13.

RESULTS: The results obtained are summarized in the tables below.

CONCLUSIONS: Negligible plant loss occurred in treated and untreated plots from attack by first generation maggots at either center. However, a considerably higher marketable yield was obtained at both places with DASANIT and BIRLANE treated plants than from untreated plants.

The double treatments in both cases gave a lower infestation index with more clean rutabagas but only at Wooddale was this reflected in higher marketable yields. Either single or double drenches of liquid DASANIT or BIRLANE provided highly satisfactory control for rutabaga transplants.

OBSERVATIONS: Although plants treated with DASANIT were paler green, and had stunted growth at time of transplanting, and for a short time afterwards, these conditions disappeared, and by mid season no visible differences between any treatments were apparent. Drought conditions throughout the summer at Wooddale reduced yields considerably.

TABLE 1. St. John's

Treatment	Mean No. Plants/Plot	Infestation** Index	Average Total Yield	Ave. Marketable Yield/Plot (kg)	Ave. Unmarketable Yield/Plot (kg)
Control	56.00	106.75	44.0	12.5	31.5
20 ml DASANIT*	59.75	10.75	48.9	48.4	0.5
20 + 20 ml DASANIT	57.50	5.25	46.5	44.8	1.7
20 ml BIRLANE	57.50	35.25	54.1	51.4	2.7
20 + 20 ml BIRLANE	59.75	23.25	51.6	50.9	0.7

TABLE 2. Wooddale

Treatment	Mean No. Plants/Plot	Infestation Index	Average Total Yield	Ave. Marketable Yield/Plot (kg)	Ave. Unmarketable Yield/Plot (kg)
Control	57.00	185.8	24.4	0.0	24.4
20 ml DASANIT*	58.00	48.8	25.0	15.0	10.0
20 + 20 ml DASANIT	56.00	25.8	27.6	21.9	5.7
20 ml BIRLANE	59.00	53.2	29.5	18.9	10.6
20 + 20 ml BIRLANE	59.00	47.5	29.0	21.1	7.9

* 20 ml = 20 ml of insecticidal solution 6 days prior to transplanting
20 + 20 = 20 ml 6 days prior to transplanting and 20 ml 6 weeks later
**Index= 0 none- 4 severe

CROP: Rutabaga cv. Laurentian

PEST: Cabbage maggot, Delia radicum (Linnaeus)

NAME AND AGENCY:
TOLMAN, J.H. and McFADDEN, G.A.
Research Centre, Agriculture Canada
University Sub Post Office
London, Ontario N6A 5B7

TITLE: MICROPLOT STUDIES ON SOIL-GRANULAR AND DRENCH-APPLIED INSECTICIDES FOR CONTROL OF CABBAGE MAGGOT ATTACKING RUTABAGA.

MATERIALS: DASANIT 15G & 720 SC (fensulfothion); COUNTER 15G (terbufos); LORSBAN 15G & 4E (chlorpyrifos); TRIGARD 3G & 75WP (cyromazine); FORTRESS 15G (SD-208304). Single-nozzled Oxford Precision Sprayer used for all drench applications.

METHODS: Rutabagas were planted near London in 2-row microplots (2.25 x 0.9 m), filled with insecticide residue-free clay loam; plots were replicated 3 times in a randomized complete block design. Where required, granular insecticides were applied on June 9, by hand shaker, in a 10-12 cm band and incorporated into the top 2.5 cm of soil using a hand cultivator. Rutabagas were then seeded by hand down the centre of the treated band and covered to a depth of 0.5-1.0 cm. Planting drench insecticides were applied, where required, immediately after planting, at 150 kPa in 500 L/ha of water, in a 10-12 cm band centred on the row. On July 16, insecticides were drench applied to only the right row of each plot in a 15 cm band at 150 kPa in 750 L/ha of water. Final application, again to only the right row of each plot, was made in a 15 cm band at 150 kPa in 2500 L/ha of water on Aug. 28. On Oct. 15, 10 rutabagas were pulled from each row of each microplot and washed. Roots were rated visually for damage according to the method of King and Forbes (1954) (0-clean; 1-light; 2-moderate; 4-severe injury) and average damage indices calculated for the 2 control programs for each treatment.

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Although planting applications of TRIGARD 3G, LORSBAN 4E and both rates of COUNTER 15G all significantly reduced cabbage maggot damage to rutabagas, no planting treatment alone provided commercially acceptable season-long control of cabbage maggot injury. With the exception of TRIGARD 75WP, drench application of insecticides, approximately 5 and 12 weeks after planting, reduced cabbage maggot damage. A program of 3 drenches of LORSBAN 4E provided best control of cabbage maggot injury. Drench application of LORSBAN 4E following planting application of COUNTER 15G (low rate), LORSBAN 15G and FORTRESS 15G (high rate) also gave acceptable control. Samples of rutabagas from the full program rows of Treatments 2,3,4, and 8 are being analyzed for insecticide residues.

TMT.	PLANTING TREATMENT ONLY					PLANTING + POSTPLANTING TREATMENTS			
No.	INSECTICIDE FORMULATION	RATE (g AI/100m)	DAMAGE INDEX	MEAN % CONTROL		INSECTICIDE FORMULATION	RATE (g AI/100m)	DAMAGE INDEX	MEAN % CONTROL
1.	DASANIT 15G	18.8	53.3 ab*	15.8	+	DASANIT 720SC	18.0	18.3 abc	52.2
2.	COUNTER 15G	16.5	30.0 b	52.6	+	LORSBAN 4E	12.0	13.3 bc	65.3
3.	COUNTER 15G	33.0	36.7 b	42.0	+	LORSBAN 4E	12.0	18.3 abc	52.2
4.	LORSBAN 15G	16.5	51.7 ab	18.3	+	LORSBAN 4E	12.0	11.7 bc	69.5
5.	TRIGARD 3G	16.5	36.7 b	42.0	+	TRIGARD 75WP	12.0	31.7 ab	17.2
6.	FORTRESS 15G	12.0	66.7 a	-	+	LORSBAN 4E	12.0	18.3 abc	52.2
7.	FORTRESS 15G	16.5	65.0 a	-	+	LORSBAN 4E	12.0	13.7 bc	64.2
8.	LORSBAN 4E	16.8	28.3 b	55.3	+	LORSBAN 4E	12.0	3.3 c	91.4
9.	Check	-	63.3 a	-		-	-	38.3 a	-

* Means within a column followed by the same number are not significantly different [P = 0.05] as determined by Duncan's New Multiple Range Test.

CROP: Sweet corn cv Seneca Horizon

PEST: European corn borer, Ostrinia nubilalis

TITLE: EVALUATION OF INSECTICIDES FOR CORN BORER CONTROL - TRIAL 1

MATERIALS: AMBUSH 500 EC (permethrin), SEVIN 480 XLR (carbaryl), SAN-415 354 WG, THURICIDE HPC (Bacillus thuringiensis)

METHODS: Sweet corn was planted on May 20th, 1987. Plots were 2 rows, spaced 91 cm apart, 9.0m in length, and replicated 4 times in a randomized block design. Spray applications were made on July 15 and 24, with a deCloet highboy sprayer, equipped with 5 hollow cone nozzles per row, 1 overhead and 4 spaced at 30 cm intervals on 2, 60 cm drop arms. The insecticides were delivered in water at the rate of 1543 L/ha at 690 kPa. Evaluations of the treatments were made on August 5 by counting the numbers of non marketable injuries observed on 20 cobs from each plot.

NAME AND AGENCY:
MORTON, J.
Kemptville College of Agricultural Technology
Kemptville, Ontario K0G 1J0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Some treatments in the trial provided a level of control of injury to the cob or plant parts yet none gave significantly fewer injuries when compared to the unsprayed check.

TREATMENT	RATE product/ha	CORN BORER DAMAGE[1]			
		Butt	Husk	Cob without Husk	Live borer on Cob
AMBUSH 500 EC	275ml	2.25 c*	4.75 b	3.25 d	1.5 c
SEVIN 480 XLR	4.0L	6.25 ba	7.25 ba	8 cba	3.25 bc
SAN-415 354 WG	0.25kg	7.75 ba	6.75 ba	9 cba	4.5 abc
SAN-415 354 WG	0.50kg	5.75 ba	10.5 a	10.25 a	6.5 a
SAN-415 354 WG	0.75kg	8.75 a	7 ba	7.75 cba	4.5 ab
SAN-415 354 WG	1.0kg	5.25 bc	6.5 ba	5.5 dc	4.25 abc
THURICIDE HPC	5.0L	5.5 b	9.25 a	9.75 ba	4 abc
UNSPRAYED CHECK		7.5 ba	6.75 ba	6.5 dcb	4 abc
LSD		3.1	4.2	3.6	2.8
CV		34	38	32.7	47

1. Number of injuries on 20 cobs.
* Means in the same column followed by the same letter are not significantly different at the 5% level according to Duncan's Multiple Range Test.

CROP: Sweet corn cv Flavourvee

PEST: European corn borer, Ostrinia nubilalis (single generation)

TITLE: EVALUATION OF INSECTICIDES FOR CORN BORER CONTROL - TRIAL 2

MATERIALS: AMBUSH 500 EC (permethrin), CYMBUSH 280 EC (cypermethrin), FURADAN 480 F (carbofuran), LANNATE 217 L (methomyl), SAN-415 354 WG, SEVIN 480 XLR (carbaryl), THURICIDE HPC (Bacillus thuringiensis)

METHODS: Sweet corn was planted on May 20th, 1987. Plots were 2 rows, spaced 91 cm apart, 9.0m in length, and replicated 4 times in a randomized block design. Spray applications were made on July 21 and 30, with a deCloet highboy sprayer, equipped with 5 hollow cone nozzles per row, 1 overhead and 4 spaced at 30 cm intervals on 2, 60 cm drop arms. The insecticides were delivered in water at the rate of 1543 L/ha at 690 kPa. Evaluations of the treatments were made on August 18 by counting the numbers of non marketable injuries observed on 20 cobs from each plot.

NAME AND AGENCY:
MORTON, J.
Kemptville College of Agricultural Technology
Kemptville, Ontario K0G 1J0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: CYMBUSH 280 EC was the only material in the test to provide significantly better control of injury on the butt and cob when compared to the level in the unsprayed check. CYMBUSH 280 EC was the only material used which provided complete control of the insect damage.

TREATMENT	RATE product/ha	CORN BORER DAMAGE[1] Butt	Husk	Cob without Husk	Live borer on Cob
AMBUSH 500 EC	275 ml	1.0 ba*	1.33 a	0.33 ba	0.0 a
FURADAN 480 F	1.1 L	2.0 ba	1.33 a	0.33 ba	0.3 a
LANNATE 217 L	2.6 L	2.0 ba	2.0 a	1.25 ba	1.0 a
SAN-415 354 WG	0.75kg	1.67 ba	3.33 a	1.33 ba	1.67 a
CYMBUSH 280 EC	300 ml	0.33 b	1.33 a	0.00 b	0.00 a
THURICIDE HPC	5.0 L	3.75 a	3.25 a	1.75 a	1.25 a
SEVIN 480 XLR	4.0 L	2.25 ba	2.0 a	0.5 ba	0.5 a
CHECK UNSPRAYED		3.75 a	4.0 a	1.75 a	1.25 a
MSE		2.7	2.3	0.87	0.95
CV		74	64	97	124

1. Number of injuries on 20 cobs.
* Means in the same column followed by the same letter are not significantly different at the 5% level (Duncan's Multiple Range Test).

CROP: Sweet Corn, cv. Jubilee

PEST: European Corn Borer, Ostrinia nubilalis

TITLE: SCREENING FOLIAR INSECTICIDES IN SWEET CORN

MATERIALS: RIPCORD 400EC (cypermethrin), DIPEL WP (Bacillus thuringiensis), LAB 166 801 100SC, KARATE 50EC (clocythrin), CAPTURE 240EC (bifenthrin), LARVIN 375EC (thiodicarb), DYFONATE 522 MS (fonofos), LORSBAN 480E (chlorpyrifos), SAN 415 354WG (Bacillus thuringiensis)

METHODS: Sweet corn was planted on June 8. Plots were 2 rows, spaced 90 cm. apart, 8m in length, replicated 4 times in a randomized complete block design. Spray applications were applied on a ten day spray schedule on Aug. 4, 14 and 24 using a back pack airblast sprayer at 240 L/ha of water. Treatments were evaluated at harvest on September 4 by counting the number of corn borers in 50 sweet corn ears.

NAME AND AGENCY:
PITBLADO, R.E.
Ridgetown College of Agricultural Technology
Ridgetown, Ontario, NOP 2C0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All of the insecticides significantly reduced the numbers of corn borers in the ears of sweet corn. Under the heavy corn borer pressures observed, three applications at 10 day intervals were not enough to lower the insect damage to a commercially acceptable level. Whenever a product was evaluated at several rate levels the higher rates provided improved insect control.

Treatments	Rate g ai/ha	% Cob Damage Corn Borers
RIPCORD 400EC	70.0	15.0a*
CAPTURE 240EC	24.0	15.0a
LARVIN 375EC	1000.0	17.0a
KARATE 50EC	10.0	18.0a
LARVIN 375EC	750.0	19.0ab
SAN 415 354WG	8.4 kg (prod)	21.0ab
CAPTURE 240EC	12.0	22.0ab
SAN 415 354WG	5.6 kg (prod)	22.0ab
DYFONATE 552 MS	1000.0	24.0ab
DIPEL WP	2.25 kg (prod)	25.0ab
LAB 166 801 100SC	120.0	28.0bc
DIPEL WP	1.75 kg (prod)	34.0c
LORSBAN 480EC	1100.0	35.0c
LARVIN 375EC	500.0	36.0c
Check		56.0d

*Values followed by the same letter are not significantly different at the 5% level. (Duncan's Multiple Range Test)

CROP: Sweet Corn, cv. Jubilee

PEST: European Corn Borer, Ostrinia nubilalis

TITLE: SCREENING THE EXPERIMENTAL INSECTICIDE HOE 000522

MATERIALS: HOE 000522 150 Su

METHODS: Sweet corn was planted on June 8. Plots were 2 rows, spaced 90 cm. apart, 8m in length, replicated 4 times in a randomized complete block design. Spray applications were applied on Aug. 4, 14 and 24 with treatment 4 sprayed only twice on Aug. 4 and 24 using a back pack airblast sprayer at 240 L/ha of water. Treatments were evaluated at harvest on September 4 by counting the number of corn borers in 50 sweet corn ears.

NAME AND AGENCY:
PITBLADO, R.E.
Ridgetown College of Agricultural Technology
Ridgetown, Ontario, N0P 2C0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: The two formulations of DECIS, 2.5EC and 5F along with the higher rates of HOE 000522 150 Su applied on a 10 day schedule significantly reduced the number of corn borers causing ear damage in sweet corn. The lowest rate of HOE 000522 applied either on a 10 or 20 day schedule was ineffective in controlling corn borers in sweet corn.

Treatments	Spray Timing Intervals # of Applications ()	Rate g ai/ha	% Cob Damage
HOE 000522 150 Su	10 days (3)	120.0	19.0ab*
HOE 000522 150 Su	10 days (3)	80.0	19.0ab
HOE 000522 150 Su	10 days (3)	40.0	26.5c
HOE 000522 150 Su	20 days (2)	40.0	26.0c
DECIS 2.5EC	10 days (3)	15.0	15.0a
DECIS 5F	10 days (3)	15.0	14.0a
Check			28.0c

*Values followed by the same letter are not significantly different at the 5% level. (Duncan's Multiple Range Test)

CROP: Flue-cured tobacco, var. Candel

PEST: Darksided cutworm, Euxoa messoria (Harris)

TITLE: EFFECTIVENESS AND PERSISTENCE OF CAPTURE OR RIPCORD APPLIED ON SOIL SURFACE FOR CONTROL OF CUTWORMS ON TOBACCO.

MATERIALS: CAPTURE (bifenthrin) 240 EC; RIPCORD (cypermethrin) 400 EC.

METHODS: Three insecticide treatments and an untreated check, replicated four times in complete random block design, were established at the Research Station, Agriculture Canada, Delhi, Ontario. Plots were 23.2 x 4.3 m. Furthermore, two subplots (30.5 x 30.5 cm) were established in each plot. The insecticides were broadcast evenly on the soil surface using a power sprayer equipped with 80-04 Tee Jet nozzles applying 280 L/ha at a pressure of 175 kPa and 4.0 km/h speed on May 13. Two hours after application (0 day), then 3, 6, and 9 days later, ten 5th- to 6th-instar larvae of the darksided cutworm were placed on the soil surface in each subplot. The larvae were retained in the subplots by aluminum barrier strips 20.3 cm high with 8 cm embedded in the ground. Mortality counts of the larvae in each subplot were made daily for 4 days. Abbott's formula was used to correct for the mortality occurring in the untreated check. Data were transformed into angular units before analysis of variance, and Duncan's multiple range test was used to separate treatment means. Means were converted to original units for tabulation.

NAME AND AGENCY:
CHENG, H.H. and J.J. HANLON
Research Staton, Agriculture Canada
DELHI, Ontario, N4B 2W9

RESULTS: Summary of results are shown in the table below.

CONCLUSIONS: Both insecticides were highly toxic to the cutworm larvae immediately after application, and caused 100% mortality or close to 100% mortality of the cutworm larvae for 3 days at the rates applied. There were no significant differences in residual activities among the insecticidal treatments.

Residual toxicity of Capture and Ripcord applied on soil surface against 5th- and 6th-instar larvae of the darksided cutworm under field conditions, 1987.

TREATMENT		RATE (g ai/ha)	PERCENT MORTALITY OF CUTWORMS IN SUBPLOTS AT DAYS AFTER TREATMENT* 0	3	6	9
CAPTURE	240 EC	50.0	95 a	83 a	72 a	57 a
		100.0	100 a	92 a	80 a	65 a
RIPCORD	400 EC	70.0	98 a	87 a	78 a	60 a
Check		-	7 b	3 b	0 b	0 b

* Values within a column followed by the same letter are not significantly different at the 5% level as determined by Duncan's multiple range test.

CROP: Flue-cured tobacco, var. Candel

PEST: Darksided cutworm, Euxoa messoria (Harris)

TITLE: CAPTURE COMPARED WITH RIPCORD APPLIED ON SOIL SURFACE OR ON TOBACCO SEEDLINGS FOR CUTWORM CONTROL.

MATERIALS: CAPTURE (bifenthrin) 240 EC; RIPCORD (cypermethrin) 400 EC.

METHODS: Two experiments, including soil surface and tobacco seedling treatments, were conducted in the fields at the Research Station, Agriculture Canada, Delhi, Ontario. Plots were replicated 4 times in a randomized complete block design in each experiment. Each plot was 23.2 x 4.3 m and consisted of 4 rows of tobacco with 38 plants in each row, the outside 2 rows in each plot being guard rows. Furthermore, two subplots (30.5 x 30.5 cm each) were established in each plot. Tests insects were 6th- and 7th-instar larvae. Tobacco seedlings were transplanted on May 28. The insecticides were broadcast evenly on the soil surface on May 13, and on tobacco seedlings on June 2, using a power sprayer equipped with 80-04 Tee Jet nozzles applying 280 L/ha at a pressure of 175 kPa and 4.0 km/h speed. Ten larvae were placed in each subplot 2 hours before treatment. The larvae were retained in the subplots by aluminum barrier strips 20.3 cm high with 8 cm embedded in the ground. Mortality counts of the larvae in the subplots were made daily for 5 days. Abbott's formula was used to correct for the mortality occurring in the untreated check. Cutworm damaged plants from the 2 central rows in each plot were counted on June 9 and 22. The number of damaged plants recorded in the last count was expressed as a percentage of the total number of original plants within the 2 center rows of each plot. All data were transformed into angular units before analysis of variance, and Duncan's multiple range test was used to separate treatment means. Means were converted to original units for tabulation.

NAME AND AGENCY:
CHENG, H.H. and J.J. HANLON
Research Staton, Agriculture Canada
DELHI, Ontario N4B 2W9

RESULTS: See table below.

CONCLUSIONS: Data obtained from the field tests indicated that the larval mortality in all the insecticidal treatments of each test was significantly higher than that of the untreated check. All insecticidal treatments reduced cutworm-damaged plants as compared with the untreated check and showed similar degrees of effectiveness at the rate applied. CAPTURE was as effective as RIPCORD, the standard insecticide.

Comparative effectiveness of Capture and Ripcord applied as soil surface and tobacco seedling treatments against darksided cutworms in flue-cured tobacco, 1987.

TREATMENT	RATE (g ai/ha)	ACCUMULATED AVERAGE % MORTALITY		% DAMAGED PLANTS
		Soil surface	Tobacco seedling	
CAPTURE 240 EC	25.0	-	90.0 a	3.2 a
	50.0	92.5 a*	97.5 a	1.8 a
	100.0	97.5 a	-	2.4 a
RIPCORD 400 EC	70.0	95.0 a	100.0 a	0.7 a
Check	-	5.0 b	2.5 b	12.5 b

* Values within a column followed by the same letter are not significantly different at the 5% level as determined by Duncan's multiple range test.

CROP: Flue-cured tobacco, var. Candel

PEST: Darksided cutworm, Euxoa messoria (Harris)

TITLE: RESIDUAL TOXICITY OF CAPTURE AND RIPCORD APPLIED AS TOBACCO SEEDLING TREATMENTS AGAINST CUTWORMS.

MATERIALS: CAPTURE (bifenthrin) 240 EC; RIPCORD (cypermethrin) 400 EC.

METHODS: Tobacco seedlings were transplanted on May 28, 1987. On June 2, the insecticides were applied as an overall spray from a power sprayer equipped with 80-04 Tee Jet nozzles applying 280 L/ha at a pressure of 175 kPa and 4.0 km/h speed. Plots were 4 rows, 23.2 m in length and 4.3 m in width replicated 4 times in a randomized block design. Test insects were 6th- to 7th-instar larvae of the darksided cutworm. The larvae were separated into groups of ten and placed on insecticide-free dry sand in 10 cm petri dishes. After application of the insecticides, random samples of tobacco leaves were collected at regular intervals from each plot, taken to the laboratory, and equal amounts of treated leaves were placed in the petri dishes with the larvae. Mortality was assessed daily for 5 days by counting the numbers of dead larvae in each dish. Abbott's formula was used to correct for the mortality occurring in the untreated check. Data were transformed into angular units before analysis of variance, and Duncan's multiple range test was used to separate treatment means. Means were converted to original units for tabulation.

NAME AND AGENCY:
CHENG, H.H. and J.J. HANLON
Research Staton, Agriculture Canada
DELHI, Ontario, N4B 2W9

RESULTS: Data obtained from laboratory bioassays of field-collected tobacco leaves treated with insecticides against cutworms are summarized in the table below.

CONCLUSIONS: All the insecticidal treatments caused highly significant larval mortality as compared with the untreated check. Both pyrethroid insecticides, CAPTURE and RIPCORD, showed similar residual toxicity at the rate applied. There was no significant difference between CAPTURE at 25 g ai/ha and 50 g ai/ha. No phytotoxicity was observed with any of the insecticidal treatments.

Residual activities of insecticides to 6th- and 7th-instar darksided cutworms fed on field-treated tobacco leaves collected at regular intervals after treatment, 1987.

TREATMENT		RATE (g ai/ha)	PERCENT MORTALITY OF CUTWORMS AT DAYS AFTER TREATMENT*						
			0	2	4	6	8	10	12
CAPTURE	240 EC	25.0	100 a	100 a	90 a	90 a	86 a	62 a	40 a
		50.0	100 a	100 a	100 a	100 a	88 a	76 a	54 a
RIPCORD	400 EC	70.0	100 a	100 a	100 a	94 a	87 a	70 a	46 a
Check		-	5 b	0 b	2 b	0 b	0 b	0 b	0 b

* Values within a column followed by the same letter are not significantly different at the 5% level as determined by Duncan's multiple range test.

CROP: Processing Tomatoes, cv. H2653

PEST: Colorado potato beetle, Leptinotarsa decemlineata (Say)

TITLE: PROTECTION OF TOMATOES BY CHEMICAL AND MICROBIAL INSECTICIDES

NAME AND AGENCY: JAQUES, Robert P.
Agriculture Canada
Research Station
Harrow, Ontario
NOR 1G0

MATERIALS: M-ONE 4.5% (Bacillus thuringiensis var. san diego,) AMBUSH 500 EC, 500 g permethrin/L.

METHODS: Transplants of tomato cultivar H2653 were planted on May 15 in plots, each consisting of 4 rows 7 m long with 1.5 m between rows and 3 m between plots and replicated 3 times in randomized blocks. Aqueous suspensions of formulations of microbial and chemical insecticides were applied with a compressed-air sprayer (1.5 L/plot) on May 29, June 11, 19 and July 13 and 24. AMBUSH was applied on May 29 and M-ONE was applied in subsequent sprays to the plot treated by the combined program. Larvae and adults of the Colorado potato beetle were enumerated and foliar damage was assessed weekly on 10 plants/plot. At harvest, tomato fruits harvested from a 1-m section in each of the centre 2 rows of each plot were weighed and graded according to maturity and damage by insects, diseases, rot and other causes.

RESULTS: Protection of tomato foliage and fruit by M-ONE and AMBUSH at the 1X rate was similar. Application of AMBUSH in the first spray to kill adults as well as larvae of the potato beetle followed by M-ONE, which kills only larvae, in subsequent sprays did not increase protection.

CONCLUSIONS: Plot tests showed that M-ONE, a microbial insecticide containing B. thuringiensis is effective in protecting tomatoes against the Colorado potato beetle.

PLOT TREATMENT	POPULATIONS OF POTATO BEETLE Larvae (+ Adults)/10 Plants						CROP DAMAGE (FOLIAR) % of Foliage Eaten (mean of 10 plants)			CROP YIELD (Tonnes/Ha)	
	Je2	Je8	Je17	Je24	Jly7	Aug7	Je8	Jly7	Aug7	Total	Ripe Undamaged
M-ONE 1/4X[1]	0(3)	0b(4)[2]	69a(1)	15b(1)	10ab(2)	2b(8)	2.8ab	1.1ab	4.3b	54.56a	36.06ab
M-ONE 1/2X	0(4)	7b(4)	52a(1)	6b(0)	3ab(1)	15ab(19)	3.4ab	0.5b	10.5b	51.08a	36.72b
M-ONE 1X	0(3)	5b(5)	53a(3)	4b(0)	7ab(1)	6ab(16)	3.1ab	1.7ab	6.8b	48.42a	33.36ab
M-ONE 2X	0(4)	3b(6)	18a(0)	1b(0)	1b(1)	11ab(18)	3.3ab	0.1b	9.0b	57.97a	39.61b
AMBUSH 1X + M-ONE 1X	0(2)	1b(4)	53a(2)	2b(0)	2b(1)	12ab(10)	2.1b	0.2b	4.8b	47.46a	33.91ab
AMBUSH 1X	0(3)	9b(5)	70a(0)	12b(0)	1b(1)	8ab(4)	3.6ab	0.8ab	4.4b	55.08a	37.97b
Nontreated check	0(5)	38a(3)	80a(1)	62a(1)	14a(19)	18a(27)	5.5a	2.2a	20.8a	48.07a	25.90a

[1] 1X rates were M-ONE 4.676 L/ha and AMBUSH 500 EC 200 ml/ha

[2] Data followed by same letter are not significantly different (p=0.05) by Duncan's Multiple Range Test.

CROP: Tomato, cv. JET STAR

PEST: Colorado Potato Beetle
Leptinotarsa decemlineata (Say)

TITLE: CONTROL OF COLORADO POTATO BEETLE WITH FOLIAR APPLICATIONS OF VARIOUS DELTAMETHRIN FORMULATIONS.

MATERIALS: DECIS 2.5 EC, (deltamethrin), DECIS 5.0 F, DECIS 5% WP, THIODAN 4 EC, (endosulfan.)

METHODS: Tomatoes were transplanted on May 23, 1987, in 0.91m rows. Insecticide treatments were applied on June 30, using a hand held CO_2 pressurized sprayer having SS8002 nozzles delivering 193 L/ha at a pressure of 275 kPa. Each plot consisted of two 5.0m long rows of tomatoes. Treatments were replicated four times in a randomized complete block design. Assessments were made at 2, 4 and 6 days after application. The number of live larvae present on each tomato plant in the plot was recorded. At the time of application, the larvae were in the 1-4 instar stage.

NAME AND AGENCY:
McDONALD, I.D.
Hoechst Canada Inc.,
Cambridge, ON
N1R 5Y2

RESULTS: Results of the experiment are summarized in the table below. Populations in the control experienced substantial reductions over the eight days of the experiment.

CONCLUSIONS: There were no significant treatment effects on the first or third assessment dates. On the second assessment date significant treatment effects were observed. The DECIS 5.0 F did not provide significant reductions in Colorado Potato Beetle larvae compared to the control at either rate of application. As well the DECIS 5.0 F treatments were not significantly different from the other insecticide treatments tested. DECIS 2.5 EC and 5% WP provided significant reductions in Colorado Potato Beetle larvae compared to the control. No significant differences between the EC and WP formulations or between rates of the EC were evident. THIODAN provided a significant reduction in larvae compared to the control but not significantly different from the DECIS EC or WP treatments.

TREATMENT	RATE (g ai/ha)	COLORADO POTATO BEETLE COUNTS[1] PRE SPRAY COUNTS JUNE 30	POST APPLICATION COUNTS JULY 2	JULY 4	JULY 6
CONTROL	-	77.0 NSD[2]	17.3 NSD	12.3 a[4]	7.5 NSD
DECIS 2.5 EC	7.5	42.0	2.8 (70.3)[3]	0.3 b (96.3)	0.8 (80.4)
DECIS 2.5 EC	12.5	38.5	2.5 (71.1)	0.5 b (91.9)	1.3 (65.3)
DECIS 5.0 F	7.5	52.5	7.3 (38.1)	4.3 ab (48.7)	1.5 (70.7)
DECIS 5.0 F	12.5	56.0	5.8 (53.9)	5.3 ab (40.8)	4.8 (12.0)
DECIS 5% WP	7.5	35.0	3.0 (61.8)	2.3 b (58.9)	2.3 (32.5)
THIODAN 4 EC	600.0	35.0	1.8 (77.7)	0.8 b (85.7)	1.3 (61.9)

[1] Average number of live larvae per 14 plants.

[2] NSD = no significant difference ($p = 0.05$).

[3] Percent population reduction compared to the control as determined by use of Abbott's formula.

[4] Values followed by the same letter are not significantly different ($p = 0.05$) according to Duncan's Multiple Range Test.

CROP: Tomato var. Glamour

PEST: Colorado Potato Beetle, *Leptinotarsa decemlineata* (Say), Tomato Hornworm, *Manduca quinquemaculata* (Haworth)

TITLE: EVALUATION OF PRODUCTS FOR THE CONTROL OF TOMATO INSECTS, 1987

MATERIALS: KARATE 50 EC (PP 321 50 g/L), CYMBUSH 250 EC (cypermethrin 250 g/L), THURICIDE HPC (*Bacillus thuringiensis* Berliner var. Kurstaki 4,000 i.u./mg)

METHODS: Tomato seedlings were transplanted May 28 into rows 1.5 m apart. Plots consisted of two rows, each 5 meters long and were replicated 4 times in a completely randomized block design. Treatments were applied June 30 and August 5 with a CO_2 sprayer calibrated to deliver a total volume of 500 L/ha. Assessments included counts of the number of insects in the entire plot, and the percentage defoliation of the entire plot.
Location: Copetown, Ontario

NAME AND AGENCY:

ZANDSTRA, J.W.,
SMITH, D.B.
Chipman, A Business Unit of C-I-L Inc.
400 Jones Road
Stoney Creek, Ontario
L8G 3Z1

RESULTS: The results are summarized in the table below.

CONCLUSIONS: None of the insecticide treatments caused statistically significant reductions in Colorado Potato beetle or tomato hornworm numbers due to low and variable population pressure. All insecticide treatments significantly reduced defoliation compared to the check. KARATE at 7.5 g ai/ha and CYMBUSH at 35.0 g ai/ha provided the most effective control and were significantly superior to THURICIDE.

TREATMENT	RATE (kg ai/ha)	COLORADO POTATO BEETLE[1] July 2		COLORADO POTATO BEETLE[1] July 7		TOMATO HORNWORM[1] Aug 6		TOMATO HORNWORM[1] Aug 11		TOMATO HORNWORM DAMAGE[2] Aug 6		TOMATO HORNWORM DAMAGE[2] Aug 11	
KARATE 50 EC	0.0050	0.0 a*	(100)[3]	0.3 a	(79)	0.0 a	(100)	0.0 a	(100)	0.4 ab	(92)	0.1 ab	(97)
KARATE 50 EC	0.0075	0.0 a	(100)	0.0 a	(100)	0.3 a	(88)	0.0 a	(100)	0.2 a	(96)	0.0 a	(100)
CYMBUSH 250 EC	0.0350	0.0 a	(100)	0.0 a	(100)	0.4 a	(83)	0.0 a	(100)	0.1 a	(98)	0.0 a	(100)
THURICIDE HPC	1.5000**	2.7 a	(0)	0.5 a	(64)	1.1 a	(54)	0.0 a	(100)	1.3 b	(75)	0.7 b	(77)
Check	-	1.1 a	-	1.4 a	-	2.4 a	-	0.2 a	-	5.3 c	-	3.0 c	-

1. Average number of insects in entire plot.
2. Average percent defoliation per plot.
3. Percent control relative to the check.

* Treatment means in the same column with no letter in common are significantly different at the 5% level (t-test).
** THURICIDE rate is L/ha (product).

CROP: Tomato, cv. Heinz 2653

PEST: Darksided cutworm, Euxoa messoria (Harris)
Flea beetles (species undetermined)
Aphids (species undetermined)

TITLE: CONTROL OF EARLY-SEASON INSECTS ON TOMATO PLANTS WITH ORTHENE IN THE TRANSPLANT WATER.

MATERIALS: ORTHENE (acephate) 75% SP.

METHODS: Tomato seedlings were transplanted on May 28, 1987. Orthene 75 SP was applied as a transplant-water treatment at the rates of 1.12, 1.68, 2.24 and 3.36 kg ai/ha, using 125 mL of water per plant. Plots were 7 m in length and 2.2 m in width replicated 4 times in a randomized complete block design. Each plot consisted of 2 rows of tomatoes with 23 plants in each row. Effectiveness of the treatments for cutworm control was evaluated by counting the number of cutworm damaged plants in each plot 2 weeks after transplanting. Toxicity and persistence of Orthene against 6th- to 7th-instar cutworm larvae were tested by collecting random leaf samples from each plot beginning one day after transplanting and then once a week. Samples were taken to the laboratory, and equal amounts of leaves were placed in 10-cm petri dishes containing insecticide-free sand and 10 cutworm larvae. Mortality was assessed daily for 4 days by counting the number of dead larvae in each dish. Abbott's formula was used to correct for the mortality occurring in the untreated check. For evaluation of flea beetle control, 20 leaves were collected at random from each plot 3 weeks after transplanting. The number of feeding holes on each leaf was counted. To assess for aphid control, 20 leaves were collected at random from each plot at 3 and 6 weeks after transplanting. The number of living aphids on each leaf was counted under a magnifier in the laboratory. The mortality percentages of the cutworms were transformed to angular units. The logarithmic transformation was used for the aphid counts. The number of flea beetle feeding holes on the leaves and cutworm-damaged plants in each plot was transformed to $\sqrt{X + 0.5}$ before analysis of variance. Duncan's multiple range test was used to separate the treatment means. Mean values were converted to original units for presentation in the table.

RESULTS: Results are summarized in the table below.

CONCLUSIONS: The level of natural cutworm infestation was low in the experimental plots. There were no significant differences between the number of cutworm-damaged plants in the plots treated with ORTHENE and the check. However, data obtained from laboratory bioassay tests indicated that leaves from ORTHENE treated plants were highly toxic to the cutworms. In general, ORTHENE transplant-water treatments were effective for control of several early-season insect pests on tomatoes for over 2 to 6 weeks, depending upon the species and the rate of application. The high rate of ORTHENE appeared to cause brown and burned spots on the leaves, but no adverse effects on the plant growth.

NAME AND AGENCY:
CHENG, H.H. and J.J. HANLON
Research Staton, Agriculture Canada
DELHI, Ontario, N4B 2W9

Effectiveness of Orthene applied as transplant-water treatments against cutworms, flea beetles and aphids on tomatoes, 1987.

TREATMENT	RATE (kg ai/ha)	NO. CUTWORM DAMAGED PLANTS/PLOT†	PERCENT MORTALITY OF CUTWORMS (DAYS AFTER PLANTING)* 1	8	15	22	NO. FLEA BEETLE FEEDING HOLES PER 20 LEAVES*	NO. LIVING APHIDS/ 20 LEAVES (WEEKS AFTER PLANTING)* 3	6
ORTHENE 75 SP	1.12	1.2	100 a	100 a	98 a	68 b	12.6 b	1.4 a	10.2 ab
	1.68	0.8	100 a	100 a	100 a	75 ab	3.5 a	0.9 a	12.7 b
	2.24	0.2	100 a	100 a	100 a	100 a	2.8 a	1.0 a	8.4 ab
	3.36	0.4	100 a	100 a	100 a	100 a	2.0 a	0.6 a	5.3 a
Check	-	3.8	0 b	2 b	0 b	0 c	37.4 c	51.7 b	184.6 c

* Values within a column followed by the same letter are not significantly different at the 5% level as determined by Duncan's multiple range test.
† F test not significant for these data.

CROP: Stubble turnip, (*Brassica rapa*), cv. Appin

PEST: Purplebacked cabbageworm (PBCW), *Evergestis pallidata* (Hufn.)

TITLE: CONTROL OF PURPLEBACKED CABBAGEWORM LARVAE ON STUBBLE TURNIP WITH FOLIAR SPRAYS OF INSECTICIDES, 1987.

NAME AND AGENCY:
STEWART, J.G. and KUNELIUS, H.T.
Agriculture Canada, Research Station
Charlottetown, Prince Edward Island
C1A 7M8

MATERIALS: POUNCE 3.2 EC (permethrin), DIPEL WP (*Bacillus thuringiensis*), HOE 000522 (teflubenzuron), DECIS 2.5 EC (deltamethrin).

METHODS: Seeds were planted at Upton, P.E.I. on July 2, 1987. Seeds were spaced at ca. 15 cm within rows and at ca. 30 cm between rows. Each four row plot measured ca. 1.2 m x 5.0 m. The outer row of each plot and the first and last plant in each row served as a buffer. Plots were arranged in a randomized complete block design with five treatments each replicated four times. Insecticides were applied on August 27 with a CO_2 precision sprayer equipped with two disc-core type hollow cone spray nozzles per row. The sprayer delivered ca. 415 L of spray mixture at a pressure of ca. 240 kPa. The check plots received water only. Plants were sampled on August 26 (prespray), August 31, September 3, and 11. Forty plants per treatment were uprooted on each sampling date and the number of larvae of PBCW were counted. Wet weights of 40 plants per treatment were measured on September 11. Analyses of variance and Duncan's Multiple Range Tests were performed on the data.

RESULTS: Results are summarized in Table 1.

CONCLUSIONS: Larvae of PBCW were effectively controlled four days after treatment with POUNCE 3.2 EC at 70 g a.i./ha and DECIS 2.5 EC at 10 g a.i./ha. DIPEL WP at 8.8 B.I.U./ha was not as effective in controlling larvae of PBCW four and seven days after treatment as were POUNCE and DECIS. Wet weights of plants treated with POUNCE 3.2 EC, DIPEL WP, and DECIS 2.5 EC were greater than the wet weights of plants from the check plots and from the plots treated with HOE 00522. This trend, however, was not statistically significant.

TREATMENT	RATE (g a.i./ha)	NO. PBCW LARVAE/PLANT (± S.E.) Aug. 26	Aug. 31	Sept. 3	Sept. 11	TOTAL PLANT WT. (g) (±S.E.)
POUNCE 3.2 EC	70	2.0[a1] ± 0.2	0.1[c] ± 0.0	0.0[b] ± 0.0	0.1[a] ± 0.1	386[a] ± 33
DIPEL WP	8.8[2]	1.9[a] ± 0.3	0.9[ab] ± 0.3	1.3[a] ± 0.6	0.8[a] ± 0.4	380[a] ± 58
HOE 000522	60	1.9[a] ± 0.3	0.4[bc] ± 0.3	0.2[b] ± 0.1	0.1[a] ± 0.1	318[a] ± 41
DECIS 2.5 EC	10	2.1[a] ± 0.5	0.1[c] ± 0.0	0.0[b] ± 0.0	0.2[a] ± 0.1	397[a] ± 24
Check	0	1.6[a] ± 0.3	1.0[a] ± 0.2	0.4[b] ± 0.2	0.4[a] ± 0.1	338[a] ± 26

[1]Numbers in a column followed by the same letter are not statistically different (p = 0.05), Duncans Multiple Range Test). Each mean is the average of four replicates with ten observations per replicate.
[2]Rate of DIPEL WP was 8.8 B.I.U./ha.

Insects of Cereal and Forage Crops

Insectes des céréales et cultures fourragères

Edited by / Révisé par
M.K. Mukerji

CROP: Alfalfa/mixed grasses

PEST: Grasshopper spp.
Melanoplus sanguinipes
Melanoplus bivittatus

TITLE: EVALUATION OF FASTAC (ALPHAMETHRIN) FOR GRASSHOPPER CONTROL UNDER FIELD CONDITIONS.

MATERIALS: FASTAC (alpha-methrin F 250 g/L)
DECIS (delta-methrin F 50 g/L)
BASUDIN (diazinon EC 500 g/L)

METHODS: All treatments were applied on July 8, 1987 between 7:30 and 9:00 a.m. with a tractor-mounted sprayer (7.5m boom), using 80015 flat fan nozzles operating at 275 kPa pressure, delivering 110 L/ha. Plot size was 25 x 30m with a 7m border around the whole experiment. Treatments were replicated 4 times in a randomized complete block design at Minto, Manitoba. The grasshopper population at application was 15% 1st instar, 32% second, 35% third, 15% fourth and 3% fifth. The trial was established on an alfalfa/forage field after the first cut. Crop height was 3-8 inches. Ground temperatures varied from 13 to 20C for treatments 2-7 respectively, while canopy temperatures ranged from 14 to 21C. Winds remained calm for all applications. Grasshopper counts were taken on -1,+1, +2,+4 and +7 days by sweeping the centre 10 x 10m of each plot 10 times with a sweep net. Counts were taken between 1:00 and 4:00 p.m. Percent control was calculated using Abbott's Formula.

NAME AND AGENCY:
ROURKE, D.R.S.
Ag-Quest
Independent Agricultural Research Services
Box 144
MINTO, Manitoba ROK 1MO

RESULTS: The results are summarized in the following table.

CONCLUSIONS: All of the treatments tested gave excellent knock-down; however, control diminished slightly with the low rates of Fastac as time progressed. The addition of diazinon to the 0.01 kg ai/ha rate of Fastac enhanced grasshopper control to the level of the 0.03 kg ai/ha rate of Fastac alone. Fastac at the rate of 0.03-0.04 kg ai/ha or 0.01 kg ai/ha with diazinon gave control equal or superior to the standard rate of Decis.

Table 1. Grasshopper Counts and Percent Reduction[a]

Treatment	Rate kg ai/ha	Number of Grasshoppers/10 sweeps					% Control			
		-1 day	+1 day	+2 days	+4 days	+7 days	+1 day	+2 days	+4 days	+7 days
1. Untreated	--	95a	108a	96a	71a	61a	-	-	-	-
2. Fastac	0.01	104a	4b	5b	7b	6b	95.7b	95.5b	90.7b	89.9b
3. Fastac	0.02	113a	1b	0b	5bc	3b	99.0a	99.9a	94.2b	95.4a
4. Fastac	0.03	101a	0b	1b	0c	0b	100.0a	99.5a	100.0a	99.4a
5. Fastac	0.04	99a	0b	0b	0c	0b	100.0a	100.0a	100.0a	100.0a
6. Decis	0.006	110a	1b	0b	0c	2b	99.3a	99.8a	100.0a	97.9a
7. Fastac + Diazinon	0.01 + 0.55	104a	0b	0b	0c	1b	100.0a	100.0a	100.0a	98.5a

[a]Values in the same column which are followed by the same letter do not differ significantly at the 5% level (Duncan's MRT).

CROP: Pasture

PEST: Grasshoppers

TITLE: GRASSHOPPER CONTROL WITH LOW RATES OF SEVIN XLR

MATERIALS: SEVIN XLR (carbaryl, May & Baker Canada Inc.), DECIS 5.0 EC (deltamethrin, Hoechst Canada Inc.), FURADAN 480 F (carbofuran, Chemagro Ltd.)

METHODS: This experiment was designed to measure the degree of grasshopper control (percentage killed) afforded by spraying lower rates of SEVIN XLR than are presently recommended.

Two pastures east and south of Fort MacLeod, Alberta were divided into 4 blocks of seven 2-ha plots each (randomized complete block design). The following insecticide treatments were applied: SEVIN XLR sprayed @ 300 g AI/ha; SEVIN XLR @ 450 g AI/ha; SEVIN XLR @ 600 g AI/ha; DECIS 5.0 EC @ 7.5 g AI/ha; FURADAN 480 F @ 140 g AI/ha; 5% carbaryl bait @ 2.5 kg bait/ha (125 g AI/ha); untreated check. The carbaryl bait was prepared from SEVIN XLR and wheat bran, using a 500-kg stainless steel mixer with the following characteristics: 40 rpm, 45 cm blade radius, pressure 250 kPa. Three LF1.5 nozzles were spaced 38 cm apart on a spray boom mounted in the mixing tank. Five mL of water per kg of bait was used for line and nozzle wash.

Pasture 1 (blocks 1 & 2) was composed primarily of crested wheatgrass, russian wildrye and alfalfa. Pasture 2 (blocks 3 & 4) contained predominantly blue grama, needle & thread and silver sage.

The spray treatments were applied on June 24 and 25, 1987, using a Spirit groundsprayer, with the following basic spray parameters: 20 LF1.5 80° nozzles, spray volume 112 L/ha, pressure 276 kPa, 10.25 m swath width, speed 6.1 km/h, boom height ca. 46 cm above the vegetation. Temperatures during spraying were 20-25°C, wind 8-12 km/h. Rain fell on June 27 (19 mm) and June 30 (0.2 mm).

The grasshopper bait was applied by a truck-mounted blower-type applicator with hydraulic application rate control (modified from a Peacock Industries product to deliver bait directly into the duct aft of the blower), mounted on a 4X4 4-speed 1/2 ton truck. The truck speed was 20 km/h, and the swath width was 10 m.

Grasshopper population density was estimated from counts of the numbers of grasshoppers observed before and after treatment (sampling dates: June 23, June 26, June 30 and July 7). In each of the 28 plots, a transect of 10 quadrats (steel rod squares, 50 x 50 cm) was arranged diagonally to the direction of application.

NAME AND AGENCY:

JOHNSON, D.L., R.C. ANDREWS, L.P. WRIGHT, E. PAVLIKOVA
Agriculture Canada Research Station
Lethbridge, Alberta T1J 4B1;
MILLIGAN, B.
Union Carbide Agricultural Products Ltd.,
Calgary, Alberta T2H 0G3

Before treatment and 2, 6 and 13 days after treatment, the number of grasshoppers observed in each quadrat was recorded. The quadrats were not moved during the experiment, so that the changes in number per quarter metre could be adjusted by the pre-treatment number. Age and species composition of the grasshoppers before and after treatment were estimated from sweepnet samples. Three sweepnet samples of 50 sweeps each were collected from each plot on each sampling date.

RESULTS: Analysis of covariance of grasshopper abundance indicated significant treatment differences on all sampling dates. The mean grasshopper population densities (#/0.25 m^2) are shown in Table 1. The Abbott's adjusted mortality estimates (Table 1, in parentheses) were calculated from all blocks combined, and serve as descriptive statistics only.

The predominant grasshopper species were Ageneotettix deorum (26%), Camnula pellucida (23%), Melanoplus infantilis (12%), Melanoplus sanguinipes (11%), Aulocara elliotti (8%), Aeropedellus clavatus (7%), and Melanoplus packardii (4%) (N = 3456). A. deorum was primarily in the fifth instar. The age distribution (1-5 instar and adult) of all species was 0.4, 2.7, 9.5, 28, 46, and 13%.

CONCLUSIONS: Although the 300 g rate of carbaryl did not perform as well, the 450 and 600 g rates were effective and nearly equal in the resulting reduction in grasshopper abundance. After 6 days, the two higher carbaryl rates were approximately equal to FURADAN and DECIS EC, although the XLR did not act as quickly. On no date were the FURADAN or DECIS EC significantly more effective than the two higher rates of SEVIN XLR. Although the lower SEVIN XLR rate and the XLR bait resulted in significant reductions in grasshopper abundance, they provided significantly less grasshopper control than the other treatments (N.S. Tukey's HSD, α = 0.05). After 2 days, mortality increased linearly with rate of carbaryl (orthogonal contrasts, P = 0.02). After 13 days, both linear and quadratic effects were detected (P < .05), indicating diminishing returns with increasing rate of carbaryl application.

Table 1. Mean numbers of grasshoppers counted per quarter square metre (Abbott's % mortality* is given in parentheses).

Treatment	Rate g AI/ha	Number of grasshoppers per 0.25 m^2			
		day 0	day 2	day 6	day 13
SEVIN XLR	300	4.0	1.5 (68)	1.4 (61)	1.4 (27)
SEVIN XLR	450	3.5	0.6 (87)	0.5 (83)	0.4 (76)
SEVIN XLR	600	4.4	0.5 (90)	1.0 (74)	0.7 (67)
SEVIN XLR bait	125	3.8	1.6 (64)	0.9 (73)	0.9 (48)
DECIS EC	7.5	3.6	0.6 (87)	0.8 (75)	1.0 (42)
FURADAN F	140	4.4	0.2 (96)	0.6 (86)	0.5 (78)
Untreated	0	3.4	4.0	3.0	1.6

*Adjusted mortality estimates were calculated from total counts.

CROP: Pasture: crested wheatgrass, alfalfa

PEST: Grasshoppers

TITLE: FIELD TESTS OF GRASSHOPPER BAITS CONTAINING CHLORPYRIFOS, CARBARYL OR DYFONATE

MATERIALS: DYFONATE MS (550 g dyfonate/L, Stauffer Chemical Co.), LORSBAN 6 (chlorpyrifos 61.5%, Dow Chemical Canada Inc.), SEVIN XLR (480 g carbaryl/L, May & Baker Canada Inc.)

METHODS: This experiment was designed to measure the degree of grasshopper control (percentage killed) afforded by three unregistered active ingredients of grasshopper baits. Low rates of these insecticides in wheat bran are potentially useful components of integrated pest management programs. To determine whether uneven bait application is effective, the bait application at full coverage was compared with a method that gave one-third coverage with an equal rate per ha.

The bait was prepared in a 500-kg capacity stainless steel mixer. The insecticide was sprayed onto rapidly mixing wheat bran (40 rpm, 45 cm blade radius), @ 250 kPa through three LF1.5 nozzles spaced 38 cm apart on a spray boom mounted in the mixing tank. No water was added to the insecticide, but 5 mL of water per kg of bait was sprayed to wash the pressure line and nozzles.

A pasture near Fort MacLeod, Alberta was divided into 3 blocks of nine 2-ha plots (RCB design). The following treatments were applied:

Treatment	% AI	g AI/ha	Bran	Application method
XLR bait	5	125	coarse	even or strip
XLR bait	5	125	medium	even or strip
Lorsban bait	3	75	medium	even or strip
Dyfonate bait	3	75	coarse	even or strip
untreated check	0	0	none	none

The methods of application were as follows: even application - a 2.5 kg/ha application rate evenly applied by truck-mounted spreader; strip application - a 2.5 kg/ha application rate, but applied at three times the rate to every third swath, so that the overall rate per ha was the same.

The bait treatments were applied on June 17, 1987, with a truck-mounted blower-type applicator (modified from Peacock Industries product to deliver bait directly into the duct aft of the blower) mounted on a 4X4 4-speed 1/2 ton truck. Truck speed was 20 km/h and the swath width was 10 m. Just before, and 2 and 7 days after treatment, grasshoppers were counted in 10 quarter square metre permanent sampling sites (steel rod squares, 50 x 50 cm) per plot. The transects of quadrats were arranged diagonally to the direction of insecticide application in each plot. The quadrats were not moved during the experiment. Sweepnet samples (100 sweeps/plot with a 38-cm dia net) were collected on the pre-treatment sampling date to allow determination of the initial age and species composition.

RESULTS: The mean grasshopper population densities (#/0.25 m^2) are shown in Table 1, along with adjusted percentage mortality. The Abbott's adjusted mortality estimates were calculated from all blocks combined, and serve as descriptive statistics only. Analysis of covariance of the log-transformed counts of grasshoppers in the quadrats indicated significant treatment differences on both sampling dates.

Average temperatures during the treatment application and post-treatment periods (June 17-20) were 16, 18, 17 and 18°C; the area received 0, 13, 2 and 25 mm of rain, respectively.

The predominant grasshopper species were Camnula pellucida (54%), Melanoplus sanguinipes (18%), Aeropedellus clavatus (14%), Aulocara elliotti (6%), Melanoplus infantilis (4%), Melanoplus packardii (3%), and Ageneotettix deorum (2%) (N=3714). The age distribution (1-5 instars and adult) of all species was 3.9, 7.2, 18, 32, 24, and 14%.

CONCLUSIONS: Lorsban bait and Sevin XLR bait both gave good control, and Dyfonate gave lower control but reduced grasshopper numbers below 5/m^2 when applied evenly. After seven days, the method of even application was superior to the method of heavy application in strips (orthogonal comparison, $P < 0.05$). Although the same rate per unit area was used, the strip method resulted in poor grasshopper control, significantly lower than the reduction provided by even application. Strip treatment provided as little as half the effective mortality in some cases. Bran particle size (compared between two XLR baits) did not affect efficacy in this experiment (N.S. Tukeys's HSD, $\alpha = 0.05$).

Apparently migration and location of the bait do not occur rapidly enough in the strip application for a sufficient proportion of the grasshoppers to find the bait before it weathers away or is lost to other consumers. In this case, rain during the post-treatment monitoring period probably reduced the quantity of bait available.

Table 1. Mean numbers of grasshoppers counted per quarter square metre (Abbott's % mortality* is given in parentheses).

Treatment	Number of grasshoppers per 0.25 m^2		
	day 0	day 2	day 7
Lorsban even	3.8	0.9 (76)	0.7 (73)
Lorsban strip	5.3	1.6 (68)	1.8 (52)
XLR coarse even	6.0	1.8 (69)	1.1 (73)
XLR coarse strip	4.4	2.7 (36)	2.4 (23)
XLR medium even	5.1	0.9 (82)	1.6 (54)
XLR medium strip	4.4	3.0 (29)	2.5 (20)
Dyfonate even	3.8	1.4 (64)	1.1 (60)
Dyfonate strip	5.3	2.9 (43)	3.2 (15)
Untreated	3.8	3.6	2.6

*Adjusted mortality estimates were calculated from total counts.

NAME AND AGENCY:

JOHNSON, D.L., R.C. ANDREWS, E. PAVLIKOVA, and L.P. WRIGHT
Agriculture Canada Research Station
Lethbridge, Alberta T1J 4B1

CROP: Crested wheatgrass and alfalfa

PEST: Grasshoppers

TITLE: EFFICACY OF THE PYRETHROIDS BAYTHROID, DECIS AND FASTAC

MATERIALS: BAYTHROID (cyfluthrin, Chemagro Ltd.), DECIS 5.0 EC (deltamethrin, Hoechst Canada Inc.), FASTAC 250 SC (alphamethrin, Ciba-Geigy Canada Ltd.), FURADAN 480 F (carbofuran, Chemagro Ltd.)

METHODS: This field experiment was designed to measure the degree of grasshopper control (percentage killed) afforded by two unregistered pyrethroids (BAYTHROID and FASTAC). A previously tested pyrethroid (DECIS EC) presently registered for grasshopper control was included for comparative purposes.

A hay field east of Claresholm, Alberta was divided into three blocks, each containing eight 2-ha plots (randomized complete block design). The following insecticide treatments were applied: FASTAC 250 SC @ 10 g AI/ha, FASTAC 250 SC @ 20 g AI/ha, FASTAC 250 SC @ 30 g AI/ha, FASTAC 250 SC @ 40 g AI/ha, BAYTHROID @ 20 g AI/ha, BAYTHROID @ 30 g AI/ha, DECIS EC @ 7.5 g AI/ha, untreated check. To control grasshoppers on the borders, a plot at the end of each block was sprayed with Furadan 480F @ 140 g AI/ha.

The spray treatments were applied on July 2, 1987, using a Spirit groundsprayer. The sprayer had 20 LF1.5 80° nozzles, spray volume of 112 L/ha, pressure 276 kPa, 10.25 m swath. Sprayer speed was 6.1 km/h and the boom was ca. 46 cm above the vegetation. Weather on the day of application was clear and warm (14-20°C, reaching 26°C later in the day), with wind 0-5 km/h.

Changes in grasshopper abundance were estimated by counting grasshoppers in 15 permanent sampling sites (steel rod squares, 50 x 50 cm) in each plot. The counts were made 0, 4 and 7 days after treatment application. Three 50-sweep samples per plot (38-cm dia net) were collected before insecticide application to determine grasshopper age and species composition at the time of spraying. Treatment effects were tested via analysis of covariance with the pre-treatment counts used as the concomitant variable. The counts were log-transformed before analysis. Polynomial orthogonal contrasts were fitted to test for linear and non-linear effects of application rate of FASTAC.

NAME AND AGENCY:

JOHNSON, D.L., M. THOMSON, T. KVEDER
Agriculture Canada Research Station, Lethbridge, Alberta T1J 4B1
WILLICK, J.
Ciba-Geigy Canada Ltd. Agricultural Division, 820 - 26 St. N. Calgary, Alberta T2A 2M4
EYOLFSON, A.
Chemagro Ltd., 3 Beatty Cres., Red Deer, Alberta T4R 1L7

RESULTS: Table 1 lists the mean grasshopper population densities (#/0.25 m^2) and adjusted percentage mortality (Abbott's, calculated from untransformed counts).

The predominant grasshopper species were Camnula pellucida (70%), Melanoplus sanguinipes (15%), Melanoplus infantilis (6%), and Melanoplus packardii (5%) (N = 1013). The age distribution (1-5 instar and adult) of all species was 0.0, 0.7, 1.2, 8.8, 27, and 63%.

CONCLUSIONS: The environmental conditions at the time of the experiment were ideal for grasshopper control: low, open crop canopy, little wind, moderate population. All three pyrethroids provided significant control of grasshoppers. Reduction in grasshopper abundance by FASTAC exceeded 80% at application rates of 20 g AI/ha or more. The turning point of the curve is near 20, indicating that a rate of 20-30 g AI/ha may provide the required amount of redundancy. Grasshopper mortality increased with increasing insecticide rate up to 30 g AI/ha (after seven days, linear effect P = .001, quadratic effect P = .053). There was no difference between the 30 and 40 g AI/ha rates in this experiment.

FASTAC applied @ 10 g AI/ha was effective, but was less so than all other treatments except BAYTHROID @ 20 g AI/ha and DECIS EC (Tukey's HSD, P < .05). Grasshopper control was not improved by increasing the rate from 30 to 40 g AI/ha. There was no significant difference in the performance of BAYTHROID applied at 20 or 30 g AI/ha.

Table 1. Mean numbers of grasshoppers counted per quarter square meter (Abbott's % mortality* is given in parentheses).

Treatment	Rate (g AI/ha)	Number of grasshoppers per 0.25 m^2		
		day 0	day 4	day 7
FASTAC 250 SC	10	2.3	0.5 (71)	0.4 (74)
FASTAC 250 SC	20	1.2	0.1 (89)	0.2 (82)
FASTAC 250 SC	30	4.0	0.0 (98)	0.1 (96)
FASTAC 250 SC	40	5.4	0.1 (98)	0.1 (97)
BAYTHROID	20	2.1	0.2 (88)	0.2 (91)
BAYTHROID	30	3.5	0.1 (96)	0.2 (95)
DECIS 5.0 EC	7.5	2.8	0.1 (94)	0.2 (90)
Untreated	0	2.5	1.8	1.8

*Adjusted mortality estimates were calculated from total counts.

CROP: Native pasture

PEST: Migratory grasshoppper, Melanoplus sanguinipes (Fabricius), Two striped grasshopper, Melanoplus bivittatus (Say), Clearwinged grasshopper, Camnula pellucida (Scudder).

TITLE: KARATE RATES AND FORMULATION EFFECTS ON GRASSHOPPERS IN PASTURE, 1987

MATERIALS: KARATE FL (87 g/L PP 321), KARATE EC (100 g/L PP 321), DECIS 5FL (50 g/L deltamethrin).

METHODS: All chemical treatments were applied on June 14, 1987 at 16:30 hours, air temperature was 20°C, and wind was 5 gusting to 8 km/hr. The chemicals were applied in 100 L/ha of water using a truck sprayer equipped with 8001 SS TeeJet nozzles spaced 50 cm and set 50 cm above the crop. Plot size was 40 m x 40 m. Experimental design was a randomized complete block with 3 replications. The grasshoppers were at 1-3 instars at application. Numbers of grasshoppers were determined by counting the live number of grasshoppers per $4m^2$ screened cages randomly thrown 5 times in each plot.
Location: Duperow, Saskatchewan

NAME AND AGENCY:

PARTYKA, E.F.
Chipman, A Business Unit of C-I-L Inc.
2108C St. George Avenue
Saskatoon, Saskatchewan
S7M 0K7

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All chemical treatments significantly reduced populations of grasshoppers. The flowable formulations gave improved control and were more persistant than the EC formulation of KARATE.

Treatment	Rate kg ai/ha	MEAN COUNT OF GRASSHOPPERS PER $4m^2$				
		Prespray	1 day	3 days	7 days	14 days
KARATE EC	0.0075	67.0 a[1]	4.6 b (92.9)[2]	16.4 c (32.8)	20.8 c (71.1)	21.7 c (66.6)
KARATE EC	0.0100	79.3 a	0.4 a (99.5)	5.7 b (90.4)	12.2 bc (85.7)	17.9 bc (76.7)
KARATE FL	0.0075	59.3 a	2.2 ab (96.2)	2.6 a (94.1)	4.9 ab (92.3)	8.4 a (85.4)
DECIS 5FL	0.0040	52.3 a	0.6 a (98.8)	2.9 a (92.6)	2.9 a (94.8)	14.2 abc (72.0)
Untreated	-	51.0 a	49.4 c	38.1 d	54.9 d	49.5 d

1. Treatment means in the same column followed by the same letter are not significantly different at the 5% level (t-test).
2. Percent mortality adjusted using Abbott's formula.

CROP: Barley cv. Galt

PEST: Brown wheat mite
Petrobia latens (Müller)

TITLE: FIELD EVALUATION OF FOUR INSECTICIDES FOR CONTROL OF BROWN WHEAT MITE

MATERIALS: CYGON® 480E (dimethoate)
DECIS® FL (deltamethrin)
FURADAN® 480 (carbofuran)
LORSBAN® 4E (chlorpyrifos)

METHODS: The test was conducted near Raymond, Alberta, in a field that had been continuously cropped to barley for 5 years. Brown wheat mites were moderately abundant and the crop showed pronounced yellowing due to "barley yellow streak mosaic", a recently discovered barley disease which is associated with the brown wheat mite. The crop was in Feekes stage 3 and 4 at time of treatment.

The experiment consisted of 4 replicates in a 1 x 4 block with 15 m alleyways between replicates. Each replicate comprised 8 contiguous side-by-side plots (30 x 50 m) to which treatments were randomly assigned.

Treatments were applied between 1600 and 1930 h on June 3, 1987, using a self-propelled sprayer with a 10 m boom equipped with twenty 80° nylon LF 1.5 nozzle tips delivering 100 L/ha of spray solution at 275 kPa. During treatment, wind speed was 5 to 10 km/h, air temperature / crop height (7 cm) was 27.4° C at 1600 h and 23.1° C at 1930 h and the soil was dry to a depth of 3 cm; however, subsurface moisture reserves were good. There was no measurable rainfall between application and the final assessment 12 days later. The average daily mean temperature during the course of the experiment was 19.3° C compared to the long term normal of 14.0° C. The soil was a clay loam with 38.4% sand, 32.9% silt, and 28.7% clay, CEC 24.7 mequiv/100 g, OM 2.33%, pH 6.4.

NAME AND AGENCY:

BYERS, J. R. and W. A. CHARNETSKI
Agriculture Canada Resesarch Station
P. O. Box 3000, Main
Lethbridge, Alberta
T1J 4B1

Mites were sampled by tapping the barley plants over an adhesive-covered microscope slide held with a sampling fork. The adhesive was a mixture of 3 parts mineral oil and 1 part vaseline. On each sampling date, 4 samples were taken within 2 m of each of 3 sampling points, 15 m apart, along the midline of each plot; therefore, each plot sample consisted of 12 slides. Mites were counted with a binocular microscope and classed as larva, protonymph, deutonymph or adult.

RESULTS: The total number of mites per plot sample before and after treatment and the degree of control are summarized in the table below. The initial population was uniform across treatments. The control by even the most effective treatments was reduced by continued recruitment from hatching eggs. In the control and ineffective treatments, this recruitment happened to balance natural mortality. If only the adult and deutonymph, i.e. those stages readily visible in the field, are considered then the % control for the 2 most effective treatments, CYGON and LORSBAN at 400 g ai/ha, was 85, 99 and 95, and 87, 98 and 96 at 2, 7 and 12 days respectively.

CONCLUSIONS: CYGON and LORSBAN substantially reduced the population of brown wheat mites, whereas DECIS FL and FURADAN had little effect. It is not yet known if the reduction in brown wheat mite abundance attained by even the highest rates of CYGON and LORSBAN is sufficient to prevent development of the associated yellowing disease of barley.

Field evaluation of four insecticides for control of brown wheat mite

Treatment	Rate g ai/ha	No. of mites - All stages[1]				Mean % Control[2]		
			Days Postspray			Days Postspray		
		Prespray	02	07	12	02	07	12
Check	-	146 a	169 a	136 a	147 a	-	-	-
DECIS FL	10	159 a	167 a	144 a	134 a	11	9	23
FURADAN 480	200	157 a	202 a	178 a	164 a	1	5	13
CYGON 480E	300	151 a	95 b	64 b	46 b	46	58	69
CYGON 480E	400	151 a	65 b	34 b	22 b	62	76	84
LORSBAN 4E	200	142 a	78 b	36 b	29 b	50	71	77
LORSBAN 4E	300	132 a	68 b	22 b	26 b	51	80	79
LORSBAN 4E	400	129 a	48 b	32 b	17 b	67	70	85

[1]Mean number of mites per plot sample. Values in the same column followed by the same letter are not significantly different at the 5% level (Duncan's multiple range test).

[2]Percent control calculated by modified Abbott's formula for each replicate.

CROP: Field Corn - Seed Inbreds

PEST: European Corn Borer Ostrinia nubilalis

TITLE: COOPERATIVE CORN BORER TRIAL IN SEED CORN

MATERIALS: FURADAN 480F (carbofuran), ABG-6149 10G, (Bacillus thuringiensis), DIPEL WP BACTOSPEINE A (Bacillus thuringiensis), SAN 415 356 GR (Bacillus thuringiensis), HOE 000522 150 Su (teflubenzuron)

METHODS: On June 18 and 23 plots were selected in Pioneer seed corn fields near Chatham and Ridgetown respectively. Plots consisted of 2 rows spaced .9 meters apart and 6m in length, arranged in a randomized complete block design with 4 replications. Insecticide treatments were applied on June 18 and 23 respectively at the whorl stage of corn development. Liquid insecticides were applied as a band over the whorl in 350 L/ha of water using an Oxford precision hand held sprayer. Granular or dry materials were weighed out and sprinkled by hand over the whorls. Lodging ratings were based on a scale 1 through 10: 1, clean plant; 2-3, broken tassel; 4-5, broken stalk above the ear; 10, broken stalk below the ear or having its ear dropped. Ten stalks were randomly selected, split from top to bottom and larval tunnels measured. Shot hole damage was evaluated as follows:

Class 1. No visible leaf injury or a small amount of pin or fine shot-hole type of injury on a few leaves.
Class 2. Small amount of shot-hole type lesions on a few leaves.
Class 3. Shot-hole injury common on several leaves.
Class 4. Several leaves with shot-hole and elongated lesions.
Class 5. Several leaves with elongated lesions.
Class 6. Several leaves with elongated lesions (about 2.5 cm).
Class 7. Long lesions common on about one-half of the leaves.
Class 8. Long lesions common on about two-thirds of the leaves.
Class 9. Most of the leaves with long lesions.

NAME AND AGENCY:
SCHAAFSMA, A.W.
Ridgetown College of Agricultural Technology
Ridgetown, Ontario, NOP 2CO

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Insect pressure was relatively low at the time of spraying (< 25% of plants with shot hole damage at Chatham site and < 10% of plants with shot hole damage at Ridgetown site). Under these conditions, treatments with HOE 000522 and SAN 415 356 provided consistant season long control. Other treatments provided control of the first generation of European corn borer but control broke down with the subsequent generation(s). It was suspected that a heavy second and a partial third corn borer generation resulted in the higher level of tunnelling than expected.

Treatments	Product Rate/ha	Shot Hole Damage (1-9) Chatham July 2	Shot Hole Damage (1-9) Ridgetown July 11	Mean Lodging (1-10) Ridgetown Sept. 21	Average Tunnel Length** (cm/stalk) Chatham Sept. 4	Average Tunnel Length** (cm/stalk) Ridgetown Sept. 21
FURADAN 480F	1.1 L	1.5c*	1.3b	1.15a	1.73ab	2.95a
ABG-6149 10G	6.0 kg	1.8c	1.5b	1.13a	0.80b	1.20ab
ABG-6149 10G	12.0 kg	2.0c	1.5b	1.00a	1.73ab	1.45ab
DIPEL WP	1.75 kg	2.3bc	1.8b	1.40a	1.10b	2.75a
DIPEL WP	2.25 kg	3.0bc	1.0b	1.33a	1.70ab	1.25ab
BACTOSPEINE-A	1.15 L	3.8b	1.5b	1.05a	1.63ab	1.88a
BACTOSPEINE-A	2.3 L	3.0bc	1.5b	1.30a	0.77b	1.60ab
SAN 415 356GR	8.4 kg	2.5bc	1.0b	1.20a	0.83b	2.00a
HOE 000522 150 Su	0.8 L	3.0bc	1.5b	1.13a	0.87b	0.23b
Check		6.5a	4.0a	1.15a	2.87a	1.85a

* Values followed by the same letter are not significantly different at the 5% level. (Duncan's Multiple Range Test)

** Data transformed by SQR (n + .5) prior to analysis

CROP: Field Corn, Seed Inbred C0220

PEST: European corn borer Ostrinia nubilalis

TITLE: EUROPEAN CORN BORER CONTROL IN ARTIFICIALLY INFESTED SEED CORN

METHODS: Field corn was planted using a John Deere Max-emerge planter on May 8. Plots consisted of 2 rows, one guard, one infested spaced 0.9 meters apart and 8 meters in length arranged in a randomized complete block design with 4 replications. On June 19, 15 consecutive plants per row were infested with 2 plastic film disks placed in the whorl of each plant. Twenty-five laboratory reared European corn borer eggs were attached to each disk. On June 26 plots were treated with insecticides. Liquids were applied as a band over the whorl in 350 L/ha of water using an Oxford precision hand-held sprayer. Granular or dry materials were weighed out and sprinkled by hand over the whorls. On September 18 the 15 plants were evaluated for lodging and larval damage.

NAME AND AGENCY:
SCHAAFSMA, A.W.
Ridgetown College of Agricultural Technology
Ridgetown, Ontario, N0P 2C0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: No shot hole damage was evident after infestation. A relatively heavy and extended (2nd and partial 3rd generations) natural infestation confounded the expected results. None of the treatments significantly reduced larval tunnelling.

Treatments	Product Rate/ha	Mean Lodging** Rating (1-10)	Average Tunnel Length (cm/stalk)
FURADAN 480F	1.1 L	2.10c*	7.1ab
POUNCE 384EC	0.275 L	2.43abc	7.9ab
DYFONATE 20G	6.3 kg	3.05a	9.0ab
DYFONATE 552MS	2.3 L	2.30abc	8.6ab
LORSBAN 15G	8.3 kg	2.58abc	7.6ab
LORSBAN 480E	2.6 L	2.63abc	7.0ab
HOE 000522 150 Su	0.8 L	2.38abc	6.9ab
HOE 000522 150 Su	1.6 L	2.20bc	7.0ab
SAN 415 356GR	5.6 kg	2.57abc	8.1ab
SAN 485 356GR	11.0 kg	2.58abc	8.9ab
ABG-6149 10G	6.0 kg	2.38abc	7.9ab
ABG-6149 10G	12.0 kg	2.40abc	8.2ab
DIPEL WP	1.75 kg	3.00ab	8.4ab
DIPEL WP	2.25 kg	2.50abc	10.7a
BACTOSPEINE-A	1.15 L	2.88abc	8.2ab
BACTOSPEINE-A	2.3 L	2.57abc	8.9ab
HOE 000388 SG	11.25 g ai/100m row	2.63abc	7.1ab
Check	Infested	2.38abc	11.5a
Check	Non infested		4.7b

*Values followed by the same letter are not significantly different at the 5% level. (Duncan's Multiple Range Test)

** Lodging Ratings (1-10 scale), 1, clean plant; 2-3, broken tassel; 4-5, broken stalk above the ear; 10, broken stalk below the ear or having its ear dropped.

CROP: Field corn, cv. CO 220

PEST: Northern corn rootworm, Diabrotica barberi Smith and Lawrence and Western corn rootworm, D. virgifera virgifera LeConte

NAME AND AGENCY:
ELLIS, C.R.
BEATTIE, B.
Department of Environmental Biology,
University of Guelph,
Guelph, Ontario, N1G 2W1

TITLE: EFFICACY OF CORN ROOTWORM INSECTICIDES

MATERIALS: Broot 15GX (trimethacarb), Counter 15G (terbufos), Dasanit 15G (fensulfothion), Di-Syston 15G and 720 LC (disulfoton), Dyfonate A 20G and MM 20G (fonofos), Furadan 10G (carbofuran), Lance 15G (cloethocarb), Lorsban 15G (chlorpyrifos), PP993 1.5G, Thimet 15G (phorate).

METHODS: Fifteen granular insecticide treatments were applied to field corn at planting time (11 May) using a John Deere Max-Emerge 2-row planter. Two granular treatments (Counter and Dyfonate MM) were applied in furrow; all other granulars were applied in a 15-cm band over the rows. One spray treatment was applied (12 May) in a 15-cm band over the rows using a hand-held compressed-air sprayer. Two check plots were included for a total of 18 treatments which were replicated four times in a randomized block design at Hannon, Ontario.

Three methods were used to measure efficacy of the insecticides: 1) The surviving rootworm population was estimated from 15 x 15 x 15 cm soil samples taken 16, 17 July. Each sample included one corn root; three samples were taken per rep for all treatments except the two checks where four samples per rep were taken. Rootworms were extracted from the soil using a washing and flotation method, 2) Roots from the soil samples were washed and rated for feeding damage using a 1-6 rating scale*, and 3) One hundred corn plants per rep were observed for goosenecking damage on 22 September. Rootworm numbers and root ratings were transformed by $\sqrt{x+1}$ before analysis.

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Rootworm pressure in the plots was severe as indicated by high root ratings (>5) and goosenecking (>60%) in the checks. Starvation following destruction of the roots probably accounts for the lower-than-expected numbers of larvae in the checks. All treatments provided significant control.

Treatment	Rate (g ai/100 m)	Mean No. Rootworms Per Plant	Mean Root Rating*	Mean % Goosenecking
Broot 15GX	11.25	1.3 cde**	2.3 g	8.8
Counter 15G	11.25	1.5 cde	2.6 fg	9.3
Counter 15G (in furrow)	11.25	0.9 e	2.9 def	5.8
Dasanit 15G	11.25	2.4 cde	2.9 def	1.4
Di-Syston 15G	11.25	2.8 cde	3.0 cdef	10.8
Di-Syston 720 LC (spray)	10.80	1.5 cde	3.8 b	30.8
Dyfonate A 20G	11.00	3.2 bc	3.3 bcd	6.5
Dyfonate MM 20G	11.00	3.2 bcd	3.3 bcde	8.8
Dyfonate MM 20G (in furrow)	11.00	1.3 de	3.1 bcdef	3.0
Furadan 10G	11.00	1.5 cde	2.8 defg	10.0
Lance 15G	7.50	1.8 cde	2.6 fg	5.8
Lance 15G	10.05	1.0 e	2.8 defg	6.5
Lorsban 15G	11.25	3.2 bc	3.2 bcdef	5.3
PP993 1.5G	0.90	2.9 cde	3.6 bc	5.5
PP993 1.5G	1.13	1.1 e	2.8 def	3.0
Thimet 15G	11.25	1.6 cde	2.8 defg	4.8
Check A		5.9 a	5.4 a	71.8
Check B		5.4 ab	5.6 a	62.0

* Root rating scale: 1 - no noticeable feeding damage, 2 - feeding scars but no root pruning, 3 - at least one root pruned to within 4 cm but less than the equivalent of an entire node of roots pruned, 4 - one node or equivalent pruned, 5 - two nodes or equivalent pruned, 6 - three or more nodes pruned.

** Values followed by the same letter are not significantly different at the 5% level (Duncan's Multiple Range Test).

CROP: Field corn

PEST: Northern corn rootworm, Diabrotica longicornis barberi (Smith and Lawrence)

TITLE: EVALUATION OF PP 993G FOR THE CONTROL OF NORTHERN CORN ROOTWORM IN FIELD CORN, 1987

MATERIALS: PP 993 1.5G (PP 993 15 g ai/kg), COUNTER 15G (terbufos 15%), DYFONATE 20G (fonofos 20%).

METHODS: A 15 cm band treatment of granular insecticide was applied over farmer planted corn on May 13, 1987. The products were lightly incorporated by dragging short chains behind the applicator. Plots consisted of 4 rows, each 6 m long. Treatments were replicated 4 times and arranged in a randomized complete block design. Assessment of the treatments was made on July 24 by cutting off 3 plants per plot at ground level and removing a 15 x 15 x 15 cm soil sample around the roots. Roots were washed and the numbers of larvae in the soil were recorded.
Location: Ste. Martine, Quebec

NAME AND AGENCY:

LETENDRE, G.
Chipman, A Business Unit of C-I-L Inc.
623 Le Breton
Longueuil, Quebec
J4G 1R9

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All band treatments produced a significant reduction in corn rootworm populations. Populations were too light to observe root rot damage and no lodging occurred within the test plots. No phytotoxicity was observed in any of the treatments.

TREATMENT	RATE	AVERAGE # LARVAE/PLOT July 24
PP 993	0.0090 g ai per m of row	3.5 a[1] (67)[2]
PP 993	0.0113 g ai per m of row	2.5 a (76)
PP 993	0.0135 g ai per m of row	2.0 a (81)
COUNTER	0.1350 g ai per m of row	2.8 a (73)
DYFONATE	0.1350 g ai per m of row	4.0 a (62)
Check	-	10.5 b -

1. Treatment means in the same column followed by the same letter are not significantly different at the 5% level (t-test).
2. Percent control when compared to the check.

CROP: Field Corn var. CO220

PEST: Northern corn rootworm, Diabrotica barberi (Smith and Lawrence) and Western corn rootworm, D. virgifera virgifera Le Conte

TITLE: EVALUATION OF PP 993 G FOR CONTROL OF CORN ROOTWORM IN FIELD CORN, 1987

MATERIALS: PP 993 1.5% G, COUNTER 15% G (terbufos), DYFONATE 20% G (fonofos)

METHODS: Field corn was planted May 11 using a John Deere Max-Emerge planter. Granular insecticides were applied at planting in a 15 cm band over the row in front of the packer wheel. Plots measuring 2 m (2 rows) by 15 m were replicated 4 times in a randomized block design. Emergence counts were taken June 3. Root and soil samples measuring 15 cm x 15 cm x 15 cm were collected from 3 sites in each plot July 15. Rootworms were extracted via washing and flotation. Roots were weighed and rated according to the 1-6 damage rating scale (1 = no damage, 6 = severe damage). Numbers of lodged plants were counted July 15 and August 14. Location: Mount Hope, Ontario

NAME AND AGENCY:

PERRYMAN, M.E.
SMITH, D.B.
Chipman, A Business Unit of C-I-L Inc.
400 Jones Road
Stoney Creek, Ontario
L8G 3Z1

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Emergence was not significantly affected by any of the treatments, however, the highest numbers were recorded in plots treated with PP 993. All insecticide treatments significantly reduced lodging which exceeded 50% in the untreated plots. All treatments significantly reduced rootworm numbers with the fewest rootworms observed in plots treated with COUNTER. Average root ratings were the same for all insecticide treatments and root weights were significantly higher in all insecticide treated plots.

TREATMENT	RATE g ai/100m row	EMERGENCE[1] June 3	VIGOR RATING[2] June 3	LODGED PLANTS[3] July 15	LODGED PLANTS[3] Aug 14	ROOTWORM[4] NUMBERS July 16	ROOT[5] RATINGS July 16	ROOT[6] WEIGHT July 16
PP993 1.5G	0.90	122 a*	7.1	1.6 a	2.8 a	6.0 ab	2.3	58 a
PP993 1.5G	1.13	128 a	7.1	1.1 a	3.6 a	7.8 b	2.3	60 a
PP993 1.5G	1.35	125 a	7.3	0.9 a	3.1 a	6.2 b	2.3	61 a
COUNTER 15G	13.50	121 a	7.5	1.1 a	5.8 a	0.9 a	2.3	68 a
DYFONATE 20G	13.50	117 a	7.3	1.3 a	5.1 a	3.1 ab	2.3	66 a
untreated	-	121 a	7.0	43.4 b	63.0 b	18.1 c	3.8	42 b

1. Average number of corn seedlings per 2 row plot (15 meter row).
2. Average vigor where 1=poor vigor and 10=excellent vigor.
3. Average number of lodged plants per plot.
4. Average number of rootworms extracted per 3 roots per plot.
5. Average rating of 3 roots per plot (1=no damage, 6=severe damage).
6. Average root weight based on 3 roots per plot.

* Treatment means in the same column with no letter in common are significantly different at the 5% level (t-test).

CROP: Corn var. CO220

PEST: Northern Corn Rootworm, Diabrotica barberi: Smith and Lawrence and Western Corn Rootworm, D. virgifera virgifera Le Conte

TITLE: EVALUATION OF PP 993 1.5G FOR CONTROL OF THE CORN ROOTWORM, 1987

MATERIALS: PP 993 1.5% G, COUNTER 15% G (terbufos), DYFONATE 20% G (fonofos).

METHODS: Plots consisted of 2 rows, each 15 meters long and replicated 4 times in a randomized block design. The trial was seeded May 12 and granular treatments were applied in a 15 cm band over the row and ahead of the packing wheel using a John Deere Maxi-merge corn planter modified for research purposes. All granular treatments were incorporated using a drag chain. Emergence counts were taken June 4. Root and soil samples, each 15 x 15 x 15 cm in size, were collected from 3 sites per plot on July 17. Rootworms were extracted by washing and flotation. Washed roots were weighed and rated using the 1-6 damage rating scale (1 = no damage, 6 = severe damage).
Location: Stoney Creek, Ontario

NAME AND AGENCY:

SMITH, D.B.
Chipman, A Business Unit of C-I-L Inc.
400 Jones Road
Stoney Creek, Ontario
L8G 3Z1

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Emergence and vigor were not significantly affected by any of the treatments. All insecticide treatments significantly reduced the number of lodged plants which amounted to approximately 70% in the check plots. On July 17, significantly fewer lodged plants were observed with PP 993 at 1.13 g ai/100 m than with the standard COUNTER treatment. All insecticide treatments also significantly reduced numbers of rootworms. Fewer than expected numbers of larvae were found in check plots due to the fact that most plants were dead at the time of sampling and very little root tissue suitable for feeding remained. Root ratings were similar for all insecticide treatments and reflected an acceptable level of control. Greater root weights were recorded for all insecticide treatments versus the check plots, however, these differences were not significant.

TREATMENT	RATE (g ai/100 m)	EMERGENCE[1]	VIGOR[2] RATING	LODGED PLANTS[3]		LARVAL COUNTS[4]	ROOT RATINGS[5]	ROOT WEIGHT[6] (grams)
		June 4	June 4	July 17	Aug 14	July 17	July 17	July 17
PP993 1.5G	0.90	119 a*	7.1	0.7 ab	6.2 a	6.1 bc	2.0	54 a
PP993 1.5G	1.13	114 a	6.6	0.2 a	2.8 a	3.7 ab	2.0	56 a
PP993 1.5G	1.35	107 a	6.1	2.2 ab	2.6 a	3.9 ab	2.0	48 a
COUNTER 15G	13.50	104 a	6.8	3.2 b	6.7 a	4.5 ab	2.0	54 a
DYFONATE 20G	13.50	99 a	6.5	0.6 ab	3.8 a	2.6 a	2.2	49 a
Untreated	-	101 a	6.5	72.9 c	70.0 b	9.9 c	4.1	34 a

1. Average number of plants emerged per plot.
2. Average vigor rating where 1 = poor vigor and 10 = excellent vigor.
3. Average number of lodged plants per plot.
4. Average number of rootworms extracted per 3 roots per plot.
5. Average damage rating based on 3 roots per plot (1 = no damage, 6 = severe damage).
6. Average weight per root based on 3 roots per plot.

* Treatment means in the same column followed by the same letter are not significantly different at the 5% level (t-test).

CROP: Seed corn, C0220

PEST: Northern and Western Corn Rootworm, Diabrotica sp.

TITLE: CORN ROOTWORM CANDIDATE INSECTICIDE EVALUATION

NAME AND AGENCY:
SCHAAFSMA, A.W.
Ridgetown College of Agricultural Technology
Ridgetown, Ontario, N0P 2C0

MATERIALS: COUNTER 15G (Terbufos), THIMET 15G (Phorate), DYFONATE 552 MS (fonofos), LANCE 15G (cloethocarb), PP993 1.5G (tefluthrin), BROOT 15GX (trimethacarb), DI-SYSTON 720LC (disulfoton), HOE 000388 5G

METHODS: Field corn was planted using a John Deere Max-emerge planter at four locations; Turnerville, Strathroy, Iona Station and Dutton on May 5, 6, 11 and 20 respectively. The granular at planting ("T-band") insecticides, metered by Noble applicators, were applied in a 15 cm band ahead of the press wheel. The layby treatments were applied with a manual, ground driven, modified cone seeder and lightly incorporated by a hand cultivator on May 27, 28, June 2 and 10 respectively. Liquids, both at planting and laybys were applied as a band over the row using a hand-held Oxford precision single nozzle (No. 1) sprayer in 250 L/ha of water (and 276 kPa). Plots were single rows spaced 0.9m apart and 10m in length, arranged in a randomized complete block design, replicated 4 times. Evaluations were taken on July 15, 20 and August 5 and 11 respectively by counting the number of lodged plants per treatment (total of 45 plants per row) and by rating 4 roots per plot which were dug, washed and visually rated for rootworm damage using the Iowa scale of 1-6 (1-little or no damage, and 6-severe root pruning).

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Conditions were extremely dry throughout the rootworm development period (only a trace of rainfall at Strathroy). Under these conditions LANCE 15G, at both 11.25 and 8.44 g ai/100m, and COUNTER 15G all applied in the "T-band" provided acceptable control. All DYFONATE, THIMET, BROOT 15GX, DI-SYSTON and PP993 1.5G treatments were marginal under these extremely dry conditions. Layby treatments of BROOT 15GX and DYFONATE 20G seemed to provide better control under these conditions. At Turnerville where conditions were more favourable for growth, all treatments provided commercially acceptable control except DI-SYSTON 720LC at the lower rate.

Table 1. Corn Rootworm Damage Assessments

Treatments	Application	Rate g ai/100m row	Lodging No./8m			Rootworm Damage Ratings Iowa Scale (1-6)		
			Strath.	Turn.	Ave.	Strath.	Turn.	Ave.
COUNTER 15G	at planting*	11.25	0.8c***	0.5b	0.7b	1.3g	1.5c	1.9e
THIMET 15G	at planting	11.25	1.0c	0.5b	0.8b	1.2d-g	1.4c	1.8de
DYFONATE 20G	at planting	11.25	11.3bc	1.3b	6.3ab	3.0a-e	1.3c	2.2b-e
DYFONATE 20G	at planting	11.25	6.0c	0.0b	3.0b	2.2c-g	1.3c	1.8de
DYFONATE 552 MS	at planting	11.25	25.3a	0.5b	12.9ab	3.4abc	1.8c	2.6bcd
DYFONATE 20G	layby**	11.25	3.3c	2.8b	3.0b	2.8a-f	1.6c	2.2b-e
DYFONATE 20G (mont)	layby	11.25	4.8c	3.0b	3.9b	2.4c-g	1.7c	2.0b-e
LANCE 15G	at planting	11.25	0.3c	0.3b	0.3b	1.5g	1.4c	1.4e
LANCE 15G	at planting	8.44	0.0c	0.3b	0.2b	1.8efg	1.2c	1.5e
PP993 1.5G	at planting	1.13	0.3c	0.0b	0.2b	2.5c-g	1.6c	2.0b-e
PP993 1.5G	at planting	0.90	1.3c	0.0b	0.7b	2.4c-g	1.5c	1.9cde
BROOT 15GX	at planting	11.25	1.5c	0.0b	0.8b	2.0efg	1.4c	1.7de
BROOT 15GX	at planting	5.63	16.8ab	0.5b	8.7ab	3.8a	1.7c	2.7abc
BROOT 15GX	layby	11.25	0.8c	2.5b	1.7b	2.1d-g	1.8c	1.9cde
DY-SYSTON 720LC	layby	11.25	3.5c	2.8b	3.2b	2.5b-g	1.9c	2.2b-e
DI-SYSTON 720LC	layby	5.63	23.3a	0.3b	11.8ab	3.3a-d	2.5b	2.9ab
Check			26.0a	10.0a	18.0a	3.7ab	3.4a	3.5a

* at planting = "T-band"
** layby = at first cultivation

N.B. Data missing at 2 locations a result of poor insect pressure

*** Values followed by the same letter are not significantly different at the 5% level. (Duncan's Multiple Range Test)

CROP: Seed corn, C0220

PEST: Northern and Western Corn Rootworm, Diabrotica sp.

TITLE: COMPARISON BETWEEN AT PLANTING ("T-BAND") AND LAYBY (AT FIRST CULTIVATION) INSECTICIDE TREATMENTS FOR CORN ROOTWORM CONTROL IN SEED/FIELD CORN.

MATERIALS: COUNTER 15G (terbufos), DYFONATE 20G (fonofos), LORSBAN 15G (chlorpyrifos), THIMET 15G (phorate), FURADAN 10G (carbofuran), DI-SYSTON 720LC and 15G(d isulfoton), DASANIT 15 G (fensulfothon).

METHODS: Field corn was planted using a John Deere Max-emerge planter at four locations; Turnerville, Strathroy, Iona Station and Dutton on May 5, 6, 11 and 20 respectively. The granular at planting insecticides, metered by Noble applicators, were applied in a 15 cm. "T-band" ahead of the press wheel. The granular layby treatments were applied with a manual, ground driven, modified cone seeder directly over the row and lightly incorporated by a hand cultivator on May 27, 28, June 2 and 10 respectively. Liquids, both at planting and laybys were applied as a band over the row using a hand-held Oxford precision single nozzle (No. 1) sprayer in 250 L/ha of water and 276 kPa. Plots were single rows spaced 0.9m apart and 10m in length, arranged in a randomized complete block design, replicated 4 times. Evaluations were taken on July 15, 20, August 5 and 11 respectively by counting the number of ledged plants per treatment (total of 45 plants per row) and by rating 4 roots per plot which were dug, washed and visually rated for rootworm damage using the Iowa scale of 1-6 (1-little or no damage, and 6-severe root pruning).

NAME AND AGENCY:
SCHAAFSMA, A.W.
Ridgetown College of Agricultural Technology
Ridgetown, Ontario, N0P 2C0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Layby treatments of most materials were not significantly different from at planting treatments provided the maximum rate was used. Liquid layby treatments performed poorly, however, this was most probably due to application technique rather than the material itself. Liquid layby's were applied over the row rather than directed to the base of the plant and much of the material could have been lost on the plant surface. Using a rating of 2.0 as an economic injury level, most materials applied at the high rate provided economic control.

Table 1. Corn Rootworm Damage Assessments

Treatments	Application	Rate g ai/100m row	Lodging No./8m of Row		Root Damage Ratings Iowa Scale (1-6)			
			Strath.	Iona	Strath.	Turn.	Iona	Ave.
COUNTER 15G	at planting*	11.25	0.3c***	1.0d	1.0e	1.4b	1.4cd	1.3e
COUNTER 15G	layby**	11.25	0.3c	2.8bcd	1.5cde	1.2b	1.5bcd	1.4cde
COUNTER 15G	layby	5.63	1.8c	1.5d	1.5cde	1.7ab	1.5cde	1.6cde
DYFONATE 20G	at planting	11.25	3.3c	4.0bcd	1.8cde	1.7ab	1.5bcd	1.7cde
DYFONATE 20G	layby	11.25	1.5c	2.5cd	1.7cde	1.4b	1.2d	1.4bce
LORSBAN 15G	at planting	11.25	2.5c	1.8cd	2.0b-e	1.1b	1.9bcd	1.7cde
LORSBAN 15G	layby	11.25	2.5c	2.0cd	1.9cde	1.3b	1.8bcd	1.4cde
LORSBAN 4E	layby	11.25	7.8c	8.3b	2.3abc	1.5b	1.7bcd	1.8cde
LORSBAN 4E	layby	7.40	18.5a	4.5bcd	2.9ab	1.8ab	2.3abc	2.3ab
THIMET 15G	at planting	11.25	0.0c	1.8cd	1.2de	1.3b	1.7bcd	1.4de
THIMET 15G	layby	11.25	0.3c	0.5d	1.4cde	1.3b	1.4cd	1.3de
THIMET 15G	layby	5.63	4.8bc	4.8bcd	2.2a-d	1.8ab	1.8bcd	2.0bc
FURADAN 10G	at planting	11.25	0.3c	1.8cd	1.4cde	1.7ab	1.7bcd	1.6cde
FURADAN 10G	layby	11.25	0.8c	3.0bcd	1.4cde	1.6b	1.6bcd	1.5cde
DI-SYSTON 15G	at planting	11.25	0.8c	4.3bcd	1.4cde	1.8ab	2.4ab	1.8bcd
DI-SYSTON 15G	layby	11.25	6.3bc	7.5bc	2.0b-e	1.3b	2.0a-d	1.7cde
DI-SYSTON 720LC	at planting	10.80	15.0ab	5.0bcd	1.9b-e	1.6b	1.5bcd	1.7cde
DASANIT 15G	at planting	11.25	0.5c	3.8bcd	1.5cde	1.4b	1.7bcd	1.5cde
DASANIT 15G	layby	11.25	0.8c	3.5bcd	2.2a-d	1.4b	1.7bcd	1.8cde
Check			11.3abc	13.8a	3.0a	2.4a	2.8a	2.7a

* at planting = "T-band"
** layby = at first cultivation
*** Values followed by the same letter are not significantly different at the 5% level. (Duncan's Multiple Range Test)

CROP: Seed corn, C0220

PEST: Western and Northern Corn Rootworm, Diabrotica sp.

TITLE: COMPARISON BETWEEN "T-BAND" AND IN-FURROW INSECTICIDE TREATMENTS FOR THE CONTROL OF CORN ROOTWORM IN SEED CORN

MATERIALS: COUNTER 15G (terbufox), DYFONATE 20G (fonofos), LORSBAN 15G (chlopyrifos), LANCE 15G (cloethocarb), BROOT 15GX (trimethacarb), PP993 1.5G (tefluthrin)

METHODS: Field corn was planted using a John Deere Max-emerge planter at four locations; Turnerville, Strathroy, Iona Station and Dutton on May 5, 6, 11 and 20, respectively. The granular at planting ("T-band") treatments metered by Noble applicators were applied in a 15 cm. band ahead of the press wheel. The granular in furrow insecticides metered by Noble applicators were applied with a tube directly behind and attached to the seed delivery tube of the planter. Plots were single rows spaced 0.9m apart and 10m in length, arranged in a randomized complete block design, replicated 4 times. Evaluations were taken on May 27, 28 and June 2 and 10 respectively by counting the number of emerged corn seedlings per 8m row. On July 15, 20, August 5 and 11 the number of lodged plants per treatment were counted (total of 45 plants per row) and 4 roots per plot were dug, washed and visually rated for rootworm damage using the Iowa scale of 1-6 (1-little or no damage, and-6-severe root pruning).

RESULTS:

Table 1. Corn Rootworm Damage Assessments

Treatments	Application	Rate g ai/100m row	Lodging (No./8m) Strath.	Corn Rootworm Damage Iowa Scale (1-6) Turn.	Strath.	Ave.
COUNTER 15G	at planting*	11.25	1.3b	1.15de	1.60cd	1.375c
COUNTER 15G	in furrow	11.25	1.0b	1.65b-e	1.93bcd	1.790bc
DYFONATE 20G	at planting	11.25	6.5b	1.08e	2.35bc	1.715bc
DYFONATE 20G	in furrow	11.25	7.8b	1.97bcd	2.20bcd	2.085bc
LORSBAN 15G	at planting	11.25	1.5b	1.70b-e	1.70bcd	1.700bc
LORSBAN 15G	in furrow	11.25	4.3b	2.53ab	2.58b	2.555b
LANCE 15G	at planting	11.25	1.3b	2.00bcd	1.35d	1.675bc
LANCE 15G	in furrow	11.25	2.5b	1.72b-e	1.45cd	1.585c
BROOT 15GX	at planting	11.25	1.5b	1.68b-e	1.70bcd	1.690bc
BROOT 15GX	in furrow	11.25	1.5b	1.85b-e	1.80bcd	1.825bc
PP993 1.5G	at planting	1.13	3.0b	1.40cde	2.10bcd	1.750bc
PP993 1.5G	in furrow	1.13	1.0b	2.20abc	1.97bcd	2.085bc
THIMET 15G	in furrow	11.25	7.0b	2.13abc	2.28bcd	2.205bc
Check			27.0a	2.90a	4.15a	3.525a

* - at planting = "T-band"

** Values followed by the same letter are not significantly different at the 5% level. (Duncan's Multiple Range Test)

NAME AND AGENCY:
SCHAAFSMA, A.W.
Ridgetown College of Agricultural Technology
Ridgetown, Ontario, N0P 2C0

RESULTS: Results are summarized in the table below.

CONCLUSIONS: Comparing the activity of in furrow and "T-band" applications by insect damage and lodging the products might be ranked as good (Counter 15G, Lance 15G), moderate (Broot 15GX), and poor (Dyfonate 20G, PP993 1.5G, Thimet 15G, Lorsban 15G). Crop tolerance to the various materials applied in furrow may be ranked as commercially acceptable (Counter 15G, Dyfonate 20G, Lorsban 15G, Lance 15G and PP993 1.5G) and unacceptable (Broot 15GX and Thimet 15G).

Table 2. Crop Tolerance Assessments

Treatments	Application	Rate g ai/100m row	Crop Emergence No./2m row Ave. of 4 Sites	Crop Vigor (0-9) At First Cultivation Ave. of 4 Sites
COUNTER 15G	at planting	11.25	10.7a	8.8abc
COUNTER 15G	in furrow	11.25	10.2abc	8.4bc
DYFONATE 20G	at planting	11.25	8.9bc	8.6abc
DYFONATE 20G	in furrow	11.25	8.9bc	8.3c
LORSBAN 15G	at planting	11.25	11.5a	8.8abc
LORSBAN 15G	in furrow	11.25	11.0a	8.8abc
LANCE 15G	at planting	11.25	11.4a	8.7abc
LANCE 15G	in furrow	11.25	10.8a	8.7abc
BROOT 15GX	at planting	11.25	10.9a	8.9ab
BROOT 15GX	in furrow	11.25	8.6c	7.6d
PP993 1.5G	at planting	1.13	11.5a	8.8abc
PP993 1.5G	in furrow	1.13	11.0a	8.8abc
THIMET 15G	in furrow	11.25	8.8bc	7.6d
Check			11.0a	9.0a

CROP: Field Corn, Inbred C0220

PEST: Western Corn Rootworm Diabrotica virgifera (Le Conte)

MATERIALS: COUNTER 15G (terbufos), LORSBAN 15G (chlorpyrifos), DYFONATE 20G (fonofos)

TITLE: EVALUATION OF CORN ROOTWORM INSECTICIDES USING THE CONTROLLED INFESTATION TECHNIQUE

METHODS: Eggs from Western Corn Rootworm were harvested from field collected adults in late summer and held over winter in soil at 5°C for a period of 9 months. Eggs were removed from storage soil and suspended in a 0.15% agar solution. Plots consisted of single rows spaced 0.9 meters apart and 8 meters in length arranged in a factorial design with four replications. The single rows were divided into alternating 1 meter portions of infested and non-infested buffer strips. The 1 meter sections were infested by evenly distributing the egg suspension in an open furrow, 10 cm wide by 5 cm deep. The furrow was closed by hand raking and field corn was planted immediately into these areas on May 8 using a John Deere Max-emerge planter. The granular insecticides were applied in a 15 cm wide "T"-band ahead of the press wheel at 11.25 g ai/100m row. Each one meter infested strip was regarded as one treatment. On July 29 plant lodging assessments were taken and corn roots were dug, washed and visually evaluated for rootworm damage using the Iowa scale of 1 through 6; 1, little or no damage and 6, severe root pruning. The entire 1 m section for each treatment was evaluated.

NAME AND AGENCY:
SCHAAFSMA, A.W.
Ridgetown College of Agricultural Technology
Ridgetown, Ontario, N0P 2C0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Significant subtle differences between insecticide treatments at different levels of infestation were not detectable although numerically with Lorsban and DYFONATE fewer eggs resulted in lower damage ratings. Under the relatively dry conditions experienced, at least 1000 eggs/m were required for adequate rootworm pressure. Lodging is not necessarily a good indication of corn rootworm damage. While plants were lodged in the plots treated with COUNTER, damage ratings revealed relatively little evidence of feeding.

No. of Eggs per M. or Row	% Lodging				Corn Rootworm Damage Iowa Scale (1-6)			
	Counter	Lorsban	Dyfonate	Check	Counter	Lorsban	Dyfonate	Check
0	21.5bcd*	3.3ce	7.5bcd	18.5bcd	1.03d	1.05d	1.13d	1.40d
2000	12.5bcd	25.3bcd	0.0d	88.3a	1.35d	1.43d	1.47d	3.58ab
1500	11.8bcd	8.5bcd	4.3bcd	91.8a	1.43d	1.38d	1.38d	4.10a
1000	0.0d	4.3bcd	0.0d	39.3b	1.53d	1.10d	1.35d	3.13bc
500	0.0d	4.3bcd	0.0d	33.3bc	1.20d	1.10d	1.20d	2.80c

*Values followed by the same letter are not significantly different at the 5% level. (Duncan's Multiple Range Test)

CROP: Soybeans, cv. Corsoy 79

PEST: Seed corn maggots, Delia sp.

TITLE: SCREENING INSECTICIDES AS SEED TREATMENTS FOR THE CONTROL OF SEED CORN MAGGOTS

MATERIALS: AGROX B-3 (diazinon + lindane + Captan), ANCHOR (carbathiin + thiram), UBI 2005, 480EC (cloethocarb), PP 993 1.5G (tefluthrin)

METHODS: On May 21 soybean seeds were planted using a 3 row cone seeder during peak adult maggot flight. Plots consisted of 3 rows spaced 0.6 meters apart, by 6 meters in length at a rate of 150 seeds per row, arranged in a randomized complete block design with 4 replications. Soybeans were treated in 500g lots using a desk top seed treating device supplied by Uniroyal Chemical. PP993 granules were applied by hand three days after seeding directly over the row and raked in lightly. Herbicide application consisted of Trefian 545 EC plus Amiben 240 g/L applied ppi at the recommended rates. Estimated plant emergence (cotyledons just visible) was taken on May 29, while actual emergence counts per row were taken on June 1. On June 6 and 14 plant height was measured as an average of 10 randomly selected plants per plot to the youngest expanded trifoliate. Insect incidence was measured by digging up all seeds in 1 meter of row to check for maggots. Blood meal was applied over the centre rows immediately after planting and just prior to a rain. The plots were sown immediately after fall rye cover crop was plowed down. Yield was taken from two rows of each plot on October 14.

NAME AND AGENCY:
SCHAAFSMA, A.W.
Ridgetown College of Agricultural Technology
Ridgetown, Ontario, NOP 2CO

RESULTS: The results are summarized in the table below.

CONCLUSIONS: An oversight resulted in late application of PP993. This probably resulted in the poor performance of this treatment. While maggot infestation was higher in this treatment, plants which survived fared poorly as expressed in crop vigour, emergence and yield suggesting some phytotoxic response. All other treatments provided good control of the seed corn maggot.

RESULTS:

Treatments	Product/kg Seed	% Emergence* May 29	% Emergence* June 1	Crop Vigour***** (0-9) July 6	Ave. Plant**** Ht. (cm) July 14	Yield Tonnes/ha Oct. 14	Seed Corn Maggot % Infestation May 29
B-3	3.2 g	32.0a**	48.0a	9.0a	65.3a	3.53a	1.2c
UBI 2505 480EC + ANCHOR	0.4 ml + 6.0 ml	29.5a	47.3a	8.9a	63.0ab	3.58a	0.0a
UBI 2205 480EC + ANCHOR	0.8 + 6.0	26.5ab	50.3a	8.9a	64.5ab	3.45a	2.2c
UBI 2505 480EC + ANCHOR	1.2 + 6.0	20.5abc	44.0ab	8.8a	60.0ab	3.25a	1.3c
UBI 2505 480EC + ANCHOR	2.7 + 6.0	12.5bc	39.8b	8.9a	60.5ab	2.98ab	0.0c
PP 993 1.5G	1.13 g ai/100m row	6.5c	12.8d	6.4c	63.5ab	2.20b	19.5b
Check		8.0c	24.5c	7.8b	58.0b	3.0ba	46.1a

* % emerged of 150 seeds planted
** Values followed by the same letter are not significantly different at the 5% level. (Duncan's Multiple Range Test)
*** % seeds, seedlings infested/1m row
**** 10 plants measured/plot
***** Vigor of surviving plants

CROP: Spring Wheat, var. Chester

PEST: Grasshoppers, Melanoplus spp. and Camnula pellucida

TITLE: GRASSHOPPER CONTROL WITH AERIAL APPLICATION OF DECIS F IN SPRING WHEAT

MATERIALS: DECIS 5F (deltamethrin), FURADAN 48F (carbofuran)

METHODS: Treatments were applied to a wheat field near Assiniboia, Saskatchewan at 9:30 a.m. on July 2, 1987. Application was made with a Cessna Ag Wagon Aircraft equipped with Delavan D-6 nozzles delivering 9.4 L/ha at a pressure of 220 kPa. Ambient temperature at time of application was 17°C with a relative humidity of 90%. Plots of 8 ha in size were replicated twice in a randomized complete block design. Assessments of 50 sweeps per plot were taken just prior to spraying, and at 2, 4, 7 and 14 days after application.

NAME AND AGENCY:
WISE, I.L., DOUGLAS, R.G.
Hoechst Canada Inc.
Regina, Saskatchewan S4N 6C2

At application, 48.7% of grasshoppers were in the 2-4th instar, 34.2% in 5th, and 17.1% were adults. Camnula pellucida comprised 55.6% of the population, 43.1% were Melanoplus spp., and 1.3% were unknown. The wheat was in the flag leaf of boot emergence stage when sprayed.

RESULTS: Data is summarized in table below.

CONCLUSIONS: All treatments significantly reduced grasshopper numbers by 2 days after application. The slight superiority in control with Furadan versus both rates of Decis F after 7 days was not evident by 14 days after application. Efficacy for all treatments after 14 days was similar.

TREATMENT	RATE (g a.i./ha)	PRESPRAY COUNTS[1]	GRASSHOPPER REDUCTION 2 DAYS COUNTS	2 DAYS % ADJ[2]	4 DAYS COUNTS	4 DAYS % ADJ	7 DAYS COUNTS	7 DAYS % ADJ	14 DAYS COUNTS	14 DAYS % ADJ
Check	-	51.0	19.5 a[3]	-	21.5 a	-	29.5 a	-	19.5	-
DECIS 5F	4.0	53.5	0.5 b	97.6	2.5 b	98.9	5.0 b	83.8	0.5	97.6
DECIS 5F	5.0	61.5	0.5 b	97.9	2.5 b	90.4	10.0 b	61.4	2.0	91.5
FURADAN	160.0	88.5	1.5 b	95.6	0.5 b	98.7	2.5 b	93.3	3.0	91.1
		NSD								

[1] Counts are the average of 50 sweeps per replicate.
[2] % ADJ is % grasshopper reduction adjusted by Abbott's formula.
[3] Values followed by the same letter are not significantly different (P=0.05) according to Duncan's Multiple Range Test

CROP: Wheat cv. Neepawa

PEST: Migratory grasshoppper, Melanoplus sanguinipes (Fabricius), Two striped grasshopper, Melanoplus bivittatus (Say), Clearwinged grasshopper, Camnula pellucida (Scudder).

TITLE: PP 321 RATES AND FORMULATION EFFECTS ON GRASSHOPPERS IN SPRING WHEAT, 1987

MATERIALS: KARATE FL (87 g/L PP 321), KARATE EC (100 g/L PP 321), DECIS 5EC (50 g/L deltamethrin).

METHODS: Neepawa wheat was seeded near Biggar, Saskatchewan into sandy loam on May 5, 1987. Seeding depth was 2 cm and row spacing was 15 cm. All chemical treatments were applied on June 14, 1987 at 15:00 hours, air temperature was 23°C and wind was 5 gusting to 8 km/hr. The chemicals were applied in 100 L/ha of water using a truck sprayer equipped with 8002 SS TeeJet nozzles spaced 50 cm and set 50 cm above the crop. The crop at application was early tillering. Plot size 40 x 40 m Experimental design was a randomized complete block with 2 replications. The grasshoppers were at 1-3 instars at application. Numbers of grasshoppers were determined by counting the live number of grasshoppers per $4m^2$ screened cages randomly thrown 5 times in each plot.
Location: Biggar, Saskatchewan

NAME AND AGENCY:

PARTYKA, E.F.
Chipman, A Business Unit of C-I-L Inc.
2108C St. George Avenue
Saskatoon, Saskatchewan
S7M 0K7

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All chemical treatments significantly reduced populations of grasshoppers at 7 DAT. The flowable formulations gave better control and were more persistant than the EC formulation of PP 321.

Treatment	Rate (kg ai/ha)	MEAN COUNT OF GRASSHOPPERS/$4m^2$				
		Prespray	1 day	3 days	7 days	14 days
KARATE EC	0.0075	33.0 a	3.9 b[1]	7.8 bc	15.3 b	18.4 a
KARATE EC	0.0100	32.0 a	3.5 b	6.8 abc	15.3 b	15.0 a
KARATE FL	0.0075	42.0 a	1.5 ab	0.4 a	3.9 a	8.5 a
DECIS FL	0.0040	33.0 a	0.0 a	0.7 ab	4.5 a	12.9 a
Untreated	-	40.0 a	28.2 c	29.2 c	45.7 c	38.2 a

1. Treatment means in the same column followed by the same letter are not significantly different at the 5% level (t-test).

Medical and Veterinary Insects

Insectes d'importance médicale et vétérinaire

Edited by / Révisé par
J.A. Shemanchuk

HOST: Beef Cattle (Hereford Steers)

PEST: Biting louse, Bovicola bovis (L.) Long-nosed sucking louse, Linognathus vituli (L.)

TITLE EVALUATION OF BAYOFLY(R) AGAINST LICE ON CATTLE

NAME AND AGENCY:

SURGEONER, G. A.
FLANNIGAN, G.
Department of Environmental Biology,
University of Guelph,
Guelph, Ontario, N1G 2W1

MATERIALS: Cyfluthrin (1% AI) ready-to-use, E. Nr. 230786-034, low dose at 4 ml/100 kg and a high dose at 8ml/100 kg.

METHODS: Twelve steers were divided into three groups of four individuals and separated into three different pens with at least one pen of untreated animals between each group to act as a buffer. Two of the groups were treated with two levels of Bayofly; one group was treated at low dose of 4 mls per 100 kilograms of body weight while a second group was treated at high dose of 8 mls per 100 kilograms of body weight. The third group was not treated and acted as controls. A louse index similar to Shemanchuk et al. (1963, Can. J. An. Sci. 43: 56), was used except that 30 counts were taken from the left side of the body only. Louse counts were taken pre-treatment, and 7, 14, 21 and 42 days post-treatment. Weights were recorded pre-treatment and 42 days post-treatment. Cattle were housed in an open feedlot with slatted floors. The weights of animals were given only to show the size of animals used in this study because the different groups were fed different rations. This trial was designed to determine louse control.

RESULTS: The results are summarized in the table.

CONCLUSIONS: Bayofly(R) controlled biting lice completely and reduced sucking lice by more than 90%. This control persisted for the entire 42-day period of the trial at the low and high dose treatments. There was no evidence of irritation to animals caused by the treatments.

Effect of Bayofly(R) (cyfluthrin, 1.0% AI ready-to-use) on lice[3] populations of cattle, Elora, Ontario, 1987.

Trial Group	Mean Daily Gain (kg)	Mean Louse Index/Animal[1]				
		Pre	7	14	21	42
		(Days Post-treatment)				
Control	0.86 ± 0.13	79.5 ± 42.6	78.5 ± 39.9	90.0 ± 74.4	138.0 ± 103.0	76.0 ± 66.8
Treatment						
High Dose (8 ml/100 kg)	1.27 ± 0.30	98.5 ± 124.1	0.75[2] ± 1.0	0	0.25[2] ± 0.5	0
Low Dose (4 ml/100 kg)	1.07 ± 0.16	153.3 ± 84.6	1.25[2] ± 1.0	1.0[2] ± 0.8	0.75[2] ± 1.5	0.75[2] ± 0.5

[1]Based on four animals per sample group, includes both sucking and biting lice. Each index/animal equals total lice observed in 30 hair parts.

[2]All lice found were sucking lice.

[3]Indices/animals of sucking lice for pre-treatment and non-treated controls ranged from 0 to 34.75 with an average of 9.75.

HOST: Cattle

PEST: Black Flies (*Simulium* spp.)

TITLE: EVALUATION OF THE BLACK FLY LARVICIDE *Bacillus thuringinesis israelensis* IN THE NORTH SASKATCHEWAN RIVER.

MATERIALS: VECTOBAC 1200L.

METHODS: Artificial substrates were set out for black fly colonization 5 days before the first test samples were taken. Replicate polypropylene rope strands 4 meters long were set out in the deep, fast-flowing part of the channel and one meter long strips of plastic strapping tape were placed in fast-flowing water near the shore.

At each site four artificial substrates, consisting of 2-1 meter lengths of polypropylene rope and 2-1 meter lengths of strapping tape, were collected and preserved in 80% ethanol 24 hours before and 48 hours after *B. t. i.* treatment. Vectobac 1200L was applied by helicopter at a rate of 25.0 ppm for 1 minute. River discharge was 214.0 m^3/sec; water temperature was 15°C; and Total Suspended Solids were [1]29.0 mg/l.

Samples were sorted in the laboratory and counts of each species were made. Percent mortalities of each group were calculated; 80% was used as the lower limit of effective control.

RESULTS: *Simulium meridionale* (Riley) was the most abundant species (69.3% of the samples analysed) followed by *Simulium luggeri* Nicholson and Mickel (27.8%) and *Simulium vittatum* Zetterstedt (2.9%).

Due to a decrease in discharge of 25 m^3/sec that occurred between the 24 hour pretreatment and 48 hour postreatment sample pickup times the tape substrates became exposed or were in little current - unsuitable for black fly colonization. Thus, this data was not considered in the statistical analysis.

NAME AND AGENCY:
MASON, P.G.
Agriculture Canada, Research Station
107 Science Crescent
Saskatoon, Saskatchewan
S7N 0X2

Effective reduction of populations of *S. luggeri* (79% was considered to be close enough to 80% to be deemed effective) and *S. meridionale*, as indicated by numbers taken on rope substrates, was obtained at 3-1/2 km downstream from the point of injection (Table 1). A small reduction was observed at 1/2 km downstream from the injection. This may be due to immigration of larvae after treatment since the numbers at the control site, upstream from the treatment point, increased greatly in the postreatment samples as compared to the pretreatment samples. Thus, reduction of the larval populations exposed to *B. t. i.* 1/2 km downstream from the injection point was probably at least as high as that (80%) observed at 3-1/2 km downstream from injection. The low reduction values for *S. luggeri* and *S. meridionale* observed at 8-1/2 km suggest that the *B. t. i.* was not effective that far downstream from injection.

Effective reduction of *S. vittatum* did not occur at any site. This may be a result of the very few specimens (<13) collected from any substrate.

CONCLUSIONS: Vectobac 1200L formulation of *B. t. i.* effectively controlled larval populations of *Simulium luggeri* and *Simulium meridionale* up to 3-1/2 km downstream from the point of injection under 1987 spring conditions in the North Saskatchewan River.

[1]This measurement was taken about 100 km upstream from the study site on May 11, 1987 (pers. comm. with Sask. Env't.).

Table 1. Percent change in numbers of black fly larvae, by species, from rope artificial substrate samples taken 24 hours before and 48 hours after a *B. t. i.* injection into the North Saskatchewan River.

	S. luggeri	*S. vittatum*	*S. meridionale*
Control	+377.8[a]	+2,300.0[a]	+1,559.3[a]
1/2 km	-1.6 n.s.	+325.0 n.s.	-7.3 n.s.
3-1/2 km	-79.0[c]	-14.0 n.s.	-80.7[b]
8-1/2 km	-10.9 n.s.	+20.0[a]	-8.3 n.s.

ANOVA using LOG_{10} (x + 1.0) transformation of data: n.s. - no significant change; [a] $P<0.01$; [b] $P<0.05$; and [c] $P<0.10$.

HOST: Cattle

PEST: Horn Fly, Haematobia irritans (L.)

TITLE: EFFICACY OF 1% PERMETHRIN POUR-ON FOR CONTROL OF PYRETHROID RESISTANT HORN FLIES IN SASKATCHEWAN, 1987.

MATERIALS: Ear tags containing 10% permethrin (ATROBAN) and a 1% pour-on formulation for permethrin (DELICE).

METHODS: A group of 48 cross-bred cow with calves at side were split into two herds, herd 1 (n = 18) and herd 2 (n = 30). These herds were maintained in adjacent pastures. Herd 3 (n = 75) located 2 km from the treated groups served as a control. Each cow in the treated herds (herds 1 and 2) was tagged with one Atroban ear tag on April 30. All herds were located approximately 30 km south of Assinaboia, Saskatchewan. When horn fly numbers in herds 1 and 2 passed 30 flies per animal, the ear tags were removed from all the animals in herd 1 and 1% permethrin pour-on was applied to each cow at the rate of 150 ml per 45 kg body weight. Horn fly numbers were assessed by counting the number of flies on one side of a randomly selected group of 15 animals from each herd. All counts were made between 0700 and 1000. Resistance to permethrin in flies from herd 2 was determined by bioassay on 15 September. LD50 values for the flies from herd 2 were compared to a susceptible laboratory strain obtained from the USDA Livestock Insects Lab in Kerrville, Texas. Groups of 10-15 unsexed flies were exposed to permethrin treated filter papers for 2 hr, at which time mortality was assessed by counting those flies which were unable to stand up.

NAME AND AGENCY:

COLWELL, D. D.
Agriculture Canada Research Station
P. O. Box 3000, Main
Lethbridge, Alberta
T1J 4B1

CROWE-SWORDS, P. R. and K. W. BELCHER
Coopers Agropharm Inc.
P. O. Box 430
Ajax, Ontario
L1S 3C5

RESULTS: Results of treatments are summarized in the table. The horn flies from herd 1 and 2 were found to be resistant to permethrin. The resistance ratio for the horn flies from cows in herd 2 was 7.46. The LD50 for the horn flies from cows in herd 2 was 37.05 $\mu g/cm^2$ as compared with an LD50 of 4.97 $\mu g/cm^2$ for the USDA susceptible horn flies. A similar level of resistance was found in flies from cows in herd 1 at the time of the pour-on application of permethrin.

CONCLUSIONS: This study documented the presence of permethrin resistance in horn flies from a localized area of south-central Saskatchewan and demonstrated that a 1% pour-on formulation of permethrin gave short term control of the resistant flies. The herd in which this trial was conducted had used pyrethroid impregnated ear tags only once prior to the 1987 season. Control of horn flies in the previous year had been adequate.

Mean number of horn flies/cow in herds treated with 1% permethrin pour-on after ear tag failure (herd 1), tagged with 10% permethrin ear tags (herd 2) and in an untagged herd (herd 3) in Saskatchewan, 1987.

Date	5/06	19/06	2/07	16/07	31/07	9/08	13/08	25/08	30/08	4/09	9/09	13/09
Herd 1	3.2	3.6	4.5	10.7	32.3	39.6	37.9	1.5*	5.1	15.1	14.8	14.0
Herd 2	NC**	NC	13.2	18.0	32.8	31.9	NC	NC	NC	NC	22.7	22.1
Herd 3	NC	NC	NC	NC	353.3	NC	145.2	130.1	104.1	41.5	27.1	24.3

*1% permethrin pour-on applied 18/08/87 to Herd 1.

**No count.

HOST: Cattle

PEST: Horn fly, Haematobia irritans (L.)

TITLE: EFFICACY OF SINGLE AND MIXED COMPONENT INSECTICIDAL EAR TAGS FOR CONTROL OF HORN FLIES IN MANITOBA, 1987.

NAME AND AGENCY:
GALLOWAY, T.D., J. STRACHAN, and A. SZLANSKI, Department of Entomology, University of Manitoba, Winnipeg, MB R3T 2N2

MATERIALS AND METHODS: Two groups of 24 beef heifers each (mixed breeds) were tagged on 19-22 May at two tags per animal with tags containing 6% cypermethrin/11% diazinon. These herds were maintained in separate paddocks on pasture with 1 tagged bull each from 10-30 June, when the two groups were combined, and the bull removed, at the Gunton Bull Test Station. One herd of 38 Holstein steers was tagged at two tags per animal with tags containing 6% cypermethrin/9.6% diazinon on 19 May. These steers were kept at the Narcisse Community Pasture from 1 June - 26 August. A herd of 31 beef cows with calves at side (mixed breeds) and one bull was tagged at two 8% cypermethrin tags/adult animal on 21 May. All animals were kept on pasture from that date until beyond the end of the trial at the Narcisse Community Pasture. Two additional herds each of 31 beef cows and heifers plus calves at side (mixed breeds), were tagged at two 11% diazinon tags/adult animal, on 23-25 May. These herds belonged to Lee Wirgau and were kept in separate pastures about 10 km. SW of Narcisse. One producer-owned beef cow/calf herd (25 cows, calves and heifers, mixed breeds) about 15 km. south of Narcisse (Tillenius) was selected as an untreated check herd. Estimates of total numbers of horn flies were made for a minimum of 10 animals per herd where possible, at weekly intervals from 10 June - 25 August. Occasionally, herds could not be located on pasture and no estimates could be made on these dates.

RESULTS: The cypermethrin tags, and both combinations of cypermethrin and diazinon provided excellent season-long horn fly control (See Table 1). Horn flies were infrequently recorded on animals in these herds, and horn fly counts did not exceed an average of one fly/animal at any time during the trial. Herds with the 11% diazinon tags almost always had some horn flies, though at no time did the average number of flies exceed 5/animal. Throughout the trial, the check herd was moderately to heavily infected with horn flies. Mean horn fly counts ranged from 60-450 horn flies/animal.

There were no adverse reactions to any of the insecticidal ear tags used in this trial, and no tags had to be removed. Tag loss was minimal in all herds (8 - 15%) by 23 September (with the exception of the Holstein steers which were removed from pasture on 26 August). Most lost tags were broken at the neck of the tag with the button still present in the ear of the animal.

Table 1. Mean numbers of horn flies/adult animal in tagged and untagged herds in Manitoba, 1987.

Date	Gunton A[1]	Gunton B[1]	Narcisse[2] steers	Narcisse[3] cows	Wirgau A[4]	Wirgau B[4]	Tillenius[5]
June 10	<1(21)[6]	<1(10)	0(13)	<1(13)	N.A.	<1(11)	N.A.
16	<1(15)	0(18)	0(17)	<1(12)	0(12)	0(16)	277(11)
23	0(12)	0(14)	0(12)	0(12)	<1(13)	<1(12)	171(11)
30	<1(11)	<1(10)	0(17)	<1(15)	2(14)	N.A.	60(13)
July 7	<1(16)		0(16)	0(16)	N.A.	N.A.	140(10)
16	0(20)		<1(11)	0(16)	1(13)	<1(20)	235(12)
21	0(17)		0(17)	0(22)	5(16)	0(22)	169(12)
27	0(20)		0(17)	0(22)	2(21)	0(20)	385(13)
Aug. 4	0(25)		0(17)	0(23)	2(20)	N.A.	450(12)
12	<1(21)		0(18)	0(21)	1(13)	<1(21)	371(12)
18	0(20)		0(16)	<1(21)	2(23)	<1(21)	336(14)
25	0(21)		0(17)	0(20)	4(21)	<1(21)	192(13)

[1]two 6% cypermethrin/11% diazinon tags/animal; [2]two 6% cypermethrin/9.6% diazinon tags/animal; [3]two 8% cypermethrin tags/animal; [4]two 11% diazinon tags/animal; [5]untagged check herd; [6]numbers in brackets are numbers of animals sampled.

HOST: Beef cattle: mixed breeds

PEST: Horn fly, Haematobia irritans (L.)

TITLE: HORN FLY CONTROL WITH EAR TAGS AT DIFFERENT TAGGING RATES

NAME AND AGENCY:
MWANGALA, F.S. and GALLOWAY, T.D.
University of Manitoba
Winnipeg, Man., R3T 2N2

MATERIALS: Bovaid ear tags (8% w/w fenvalerate)
Atroban ear tags (10% w/w permethrin)

METHODS: 89 cow-calf units and 46 heifers of mixed breeds, at Glenlea Research Station, Manitoba, were divided into four herds. The herds were treated as follows:

Herd A - 2 Bovaid tags per animal
Herd B - 1 Bovaid tag per two animals
Herd C - 2 Atroban tags per animal
Herd D - 1 Atroban tag per two animals.

The cows were separated into four herds and tagged on June 1. Heifers were tagged on June 15 and put in their respective groups. The herds were rotated between pastures. Horn fly counts were made fortnightly on five to ten animals. Tag loss was also checked fortnightly. Tags were removed on September 30 when the herds were combined.

RESULTS AND CONCLUSIONS: Horn flies were observed in the 4th week on herd D when the herd had lost almost 50% of the tags, i.e., 1 tag per 4 animals. However this tag loss cannot be explained as the animals were tagged in the same manner and there was no corresponding tag loss in group C. Horn flies appeared on other herds in the 10th week. One Bovaid tag per two animals afforded the same control as two Bovaid tags per animal. There were more horn flies on herd A than herd C. This is consistent with bioassay results, where the horn flies at Glenlea were more tolerant to fenvalerate than permethrin. Horn flies were generally effectively controlled in all the herds compared to untreated herds nearby.

Table 1: Average number of horn flies per adult animal and percentage tag loss in the cow/calf herds at the Glenlea Research Station, Manitoba - 1987.

	Herd A[1]		Herd B[2]		Herd C[3]		Herd D[4]	
Date	Hf	%**	Hf	%	Hf	%	Hf	%
15 June	0	0	0	0	0	0	0	17.7
29 June	0	0	0	0	0	0	0.3	47.1
13 July	0	0	0	0	0	0	0.2	52.97
27 July	0	0	0	0	0	0	0.1	70.6
10 August	0.8	0	2.4	0	2.0	0	17.5	70.6
24 August	6.8	0	5.3	0	3.4	0	7.1	70.6
3 September	12.04	0	10.6	0	4.0	0	20.33	70.6
30 September	NC*	4.4	NC	5.9	NC	6.3	NC	70.6

NC* = No counts taken **% = % tag loss
[1] 2 Bovaid tags/adult animal; [2] 1 Boavid tag/two adult animals;
[3] 2 Atroban tags/adult animal; [4] 1 Atroban tag/two adult animals.

HOST: Cattle

PEST: Horn fly, Haematobia irritans

TITLE: SUSCEPTIBILITY OF MANITOBA HORN FLIES TO PYRETHROIDS IN EAR TAGS - 1987

NAME AND AGENCY:
MWANGALA, F.S. and GALLOWAY, T.D.
Dept. of Entomology
University of Manitoba
Winnipeg, Man. R3T 2N2

MATERIALS AND METHODS: Horn flies were collected with sweep nets from either penned or restrained cattle. The flies were transferred into a 20 cm^3 holding cage using a battery-powered mosquito aspirator (Haushers' Machine Works, Toms River, N.Y.). Fifteen to thirty flies were transferred from the holding cage into plastic petri dishes through holes in the sides, later sealed with corks. Nine cm. Whatman qualitative filter papers were laid on aluminium foil and treated with 1 ml of either fenvalerate or permethrin (technical material) in acetone using 50% serial dilutions designed to deliver doses ranging from 10 to 0.0195 mg/cm^2. The papers were left for at least 3 hours for the acetone to evaporate, after which each concentration was stored separately in aluminium foil packets in the fridge for at least 24 hrs. before use in bioassays. Controls had filter papers treated with acetone only. Each concentration was replicated twice. Where very few flies were collected, they were exposed to discriminating doses that gave 100% mortality with the susceptible strain (Kerrville USDA). Horn fly mortality was recorded immediately after flies were introduced into the petri dish assembly and 2 hours later. Immobile flies and those unable to stand were considered dead.

The data was analysed using a SAS probit computer package. Resistance ratios were calculated by dividing the LD_{50} of the field strain by the LD_{50} of the susceptible strain. The susceptible strain was obtained from USDA-ARS-Kerrville, Texas in December, 1986.

RESULTS AND DISCUSSION: The toxicities of fenvalerate and permethrin to horn fly populations are shown in Table 1. Horn flies collected from farms where cattle were not being treated for horn flies were more susceptible to the two pyrethroids than the susceptible laboratory strain. The strain from south of Morden was as susceptible to permethrin as the lab strain but was more susceptible to fenvalerate despite the fact that fenvalerate had been used for 5 years. Horn flies from Glenlea were more tolerant to fenvalerate and permethrin than the laboratory strain (RR = 4.12 and 2.71 respectively). The flies were collected from a group that had one Atroban tag for every two animals. The group had no flies early in the season. The collection was made in the 12th week from tagging and at that time the group had lost 70% of the tags. The numbers of horn flies were also increasing in other groups that had 2 tags per animal. The group with 2 Bovaid tags per animal carried more flies than the group with 2 Atroban tags/animal at the end of the season. This observation supports the bioassay results, where the horn flies at Glenlea were more tolerant to fenvalerate than permethrin. Flies appeared in both groups later in the season (10th week) which corresponds to the decreasing levels of the insecticide being released from the ear tag matrix. The absence of flies early in the season on these groups and the low level of resistance observed may be an indication that these flies can be controlled by levels of insecticide being released by the ear tags.

Horn flies collected from both Fisher Branch and east of Winkler were susceptible to both insecticides although they showed some tolerance to fenvalerate. It is interesting to note that the flies from south of Morden were more susceptible to fenvalerate than the flies from Fisher Branch even though the control regimes have been the same. The difference in susceptibility could be attributed to the presence of untreated heifers on the farm in Morden that served as refuges for flies. The flies collected from north of Carman showed 4.5 fold resistance to fenvalerate and a 14 fold resistance to permethrin even though permethrin has not been used on this farm. Another strain collected from west of Morden showed almost 2 fold resistance to permethrin and 5.5 fold resistance to fenvalerate. However these herds carried few flies compared to untagged herds which is an indication that ear tags were still effective in reducing the horn fly populations on these farms. Tolerant horn fly populations seem to occur as discrete populations as some herds within a 5 km radius of herds with tolerant horn flies had no flies on them.

Although these results are preliminary, they show that some populations of horn flies in Manitoba are beginning to develop resistance to pyrethroids used in ear tags even though they are still susceptible to pyrethroids compared to populations reported in the United States, and with the exception of the strain from north of Carman, the strains are more tolerant to fenvalerate than permethrin. These tolerances are observed on farms where ear tags have been used for at least four years.

Table 1. Susceptibilities of Manitoba horn flies to Fenvalerate Permethrin in laboratory bioassay tests-1987

	Location	Fenvalerate		Permethrin		History of Tag usage
		LD_{50}	RR*	LD_{50}	RR*	
1	Texas (susceptible)	0.208	1	1.315	1	
2	Morden South	0.1098	0.528	1.411	1.073	5 years Bovaid 1 yr. Atroban
3	Ashern	0.0216	0.104	0.732	0.0557	Not treating
4	Grunthal Auction Mart	0.143	0.69	0.828	0.63	Not treating
5	Glenlea	0.857	4.12	2.774	2.11	Tagged with Atroban
	Discriminating doses	0.625mg/cm^2 % mortality		5mg/cm^2 % mortality		
6	Fisher Branch	95.24	1.05	100	1	5 years Bovaid then 1 year Atroban
7	Winkler (East)	78.84	1.27	100	1	2 years Bovaid
8	Morden (West)	18.18	5.50	51.43	1.94	5 years Bovaid
9	Carman (North)	22.22	4.50	7.14	14.01	4 years Bovaid

*RR - resistance ratio - Test LD_{50}/LD_{50} for susceptible strain.

HOST: Cattle

PEST: Horn Fly, Haematobia irritans (L.)
Face Fly, Musca autumnalis (DeGeer)

TITLE: EFFICACY OF INSECTICIDAL EAR TAGS CONTAINING TWO ACTIVE INGREDIENTS IN COMPARISON TO STOCKAID(R) EAR TAGS.

MATERIALS: ET696 (6% cypermethrin, 9.6% diazinon), ET611 (6% cypermethrin, 11.0% diazinon), Stockaid Ear Tags (8% cypermethrin).

METHODS: A field study was conducted in southwestern Ontario during the spring and summer of 1987 to study the efficacy of three different types of fly control ear tags. Four similar cow-calf beef herds, all located within a five-mile radius and grazing on similar rangelands were used. Three of the herds were ear-tagged prior to release, and the remaining herd was released with no fly control treatment as a check. Two ear tags were applied to each cow and one tag to each calf. One herd received tags containing 6% cypermethrin and 11.0% diazinon; the second herd was tagged with tags containing 6% cypermethrin and 9.6% diazinon. The third herd was tagged with Stockaid ear tags containing 8% cypermethrin. All tags were applied prior to May 24, before fly emergence. At weekly intervals, fly counts were recorded for each of the four herds. A random fifteen cows per herd were observed for fly populations. Counts of the number of horn flies per one side of the cow and total number of face flies were recorded. Fly counts were conducted on the same day between 10:00 and 3:00 p.m. on warm, sunny days without strong winds to minimize variation due to weather. Herd size varied from 23 to 30 cattle.

NAME AND AGENCY:
POLAND, C.M., VAUGHN, F.C. and PURDY, J.
CIBA-GEIGY CANADA LTD.
1200 Franklin Blvd.
Cambridge, Ontario
N1R 6T5

RESULTS: No horn flies were observed on any of the ear tagged cattle. These included the 8% cypermethrin tags and 6% cypermethrin combined with 9.6% or 11.0% diazinon tags. The control reading reached a peak of 131 horn flies per cow side, which suggested a strong horn fly population was present. The results indicated that there were no significant differences between the control levels provided by the various tags; all treatments provided complete control of horn flies. There was a substantial reduction in face fly populations on cattle treated with ear tags, compared to the check herd. The three different insecticidal tags provided varying levels of face fly reduction, but there were no significant differences between treatments. The fly population on the ear tagged cattle varied from an average of less than 1 fly per cow to a maximum of 4 flies per cow but these numbers were significantly lower than the check average. The readings from the check herd reached a maximum average of 14 face flies per cow, indicating there was a moderate to heavy face fly population in the area.

CONCLUSIONS: Ear tags with two active ingredients (diazinon and cypermethrin) were equally effective in controlling cattle pests, - horn flies and face flies - as ear tags impregnated with cypermethrin alone.

ACKNOWLEDGEMENT: This project was financially assisted by the Ontario Ministry of Agriculture and Food under its Pest Management Research Program.

Table 1. Mean number of horn flies per side and face flies per face on a control herd and three treatment herds.

Sample Date	Control		ET 696		ET 611		Stockaid	
	HF	FF	HF	FF	HF	FF	HF	FF
May 28	5.3	1.0	0.0	0.4	0.0	1.2	0.0	0.5
June 6	2.7	0.6	0.0	0.1	0.0	0.5	0.0	0.4
June 10	14.6	2.0	0.0	0.4	0.0	0.1	0.0	0.3
June 17	27.8	0.5	0.0	0.3	0.0	0.5	0.0	0.1
June 24	22.2	11.9	0.0	0.1	0.0	0.9	0.0	0.9
July 2	71.8	2.9	0.0	0.2	0.0	1.7	0.0	0.1
July 10	85.0	5.5	0.0	1.1	0.0	1.0	0.0	1.7
July 15	85.0	5.5	0.0	1.4	0.0	1.0	0.0	0.7
July 22	89.6	9.9	0.0	1.9	0.0	1.1	0.0	0.8
July 30	100.7	9.8	0.0	3.4	0.0	1.7	0.0	1.5
Aug. 7	131.3	13.5	0.0	1.2	0.0	1.9	0.0	1.9
Aug. 14	95.3	7.8	0.0	3.6	0.0	3.7	0.0	2.1

HF = Horn Fly
FF = Face Fly

HOST: Beef Cattle

PEST: Horn fly, Haematobia irritans (L.)
Face fly, Musca autumnalis (DeGeer)

TITLE: CONTROL OF HORN FLIES AND FACE FLIES ON CATTLE USING EAR TAGS CONTAINING CYPERMETHRIN AND/OR DIAZINON

MATERIALS: Ear tags containing cypermethrin 6.0%; diazinon 11.0%; mixed (low) cypermethrin 6.0%, diazinon 9.6%; mixed (high) cypermethrin 6.0%, diazinon 11.0%. Ciba Geigy Canada Limited.

METHODS: Five separate herds of beef cattle within two kilometers of each other were used in this trial. During late May, early June, 1987, four herds were tagged with two tags per animal. One herd with tags of 6.0% cypermethrin and 9.6% diazinon, and a second herd with tags of 6.0% cypermethrin and 11.0% diazinon; the third herd with 11.0% diazinon and the fourth with 6.0% cypermethrin. A fifth herd was untreated and served as a control. At approximately weekly intervals, counts of face flies per face and horn flies per side were taken from ten animals in each herd on the same day between 9:00 a.m. and 4:00 p.m. Differences in the weekly means were analyzed by a Students t-test.

RESULTS: The results are summarized in the table.

CONCLUSIONS: Mixed tags, and the diazinon-only tags yielded complete horn fly control. The cypermethrin-only tag yielded greater than 99.99% control of horn flies. Both mixed tags and the cypermethrin-only tags gave > 70% face fly control over the entire season. The 11.0% diazinon tag gave significant face fly control for seven weeks after application. The mixed tags with the higher level of diazinon yielded better control of face flies than the tags with lower diazinon level on four of the 13 weeks of the season. There was no significant difference in face fly populations between mixed and cypermethrin tagged cattle. Less than 2% of the tags were lost by week 8, but 35% were lost by week 13.

The eye irritation on the herd tagged with the high level of diazinon was seen in about 50% of the animals. The symptoms ranged from chronic tearing to ulceration and occurred within two weeks of tagging. The condition cleared up spontaneously with few animals requiring antibiotics. This irritation seemed to be associated with feedlot conditions.

In a controlled experiment where cattle were tagged with tags containing 6% cypermethrin, 11% diazinon and 6% cypermethrin + 11% diazinon, no irritation was observed. This was substantiated by observations of other workers and blood tests in previous experiments. It is concluded that tags did not cause eye irritation.

NAME AND AGENCY:

SURGEONER, G. A.
FLANNIGAN, G.
Department of Environmental Biology,
University of Guelph,
Guelph, Ontario, N1G 2W1

Mean number[a] of horn flies per side and face flies per face on cattle herds with different insecticide ear tags, Elora, Ontario, 1987.

Sample Date	Face Flies (±)[d]					Horn Flies (±)				
	C	Mh	Ml	Cy	D	C	Mh	Ml	Cy	D
June										
4	0	0	0	-	0	22.3±10.1	0	0	-	0
11	1.8±1.3	0*	0*	-	0.3±0.7*	17.0± 9.3	0	0	-	0
16	2.8±2.5	0**	0.4±1.0*	0*	0.9±0.6*	19.3±11.7	0	0	0	0
25	7.4±5.7	0**	0.7±1.1*	0*	0.9±0.9*	14.7±10.86	0	0	0	0
July										
2	8.7±5.6	0.2±0.6**	1.1±0.9*	0.2±0.6*	1.5±1.8*	10.3± 5.5	0	0	0	0
9	8.7±5.9	0.8±1.4*	1.1±1.4*	1.8±3.1*	3.9±3.4*	13.3± 9.9	0	0	0.1±0.3b	0
16	14.3±7.4	1.2±0.8*	3.2±1.8*	1.7±1.9*	8.0±4.3*	19.5± 7.2	0	0	0	0
22	7.2±2.7	1.8±2.0*	2.8±1.6*	2.1±1.8*	2.6±2.4*	15.3± 4.9	0	0	0	0
30	13.3±6.9	5.3±2.4*	6.2±4.6*	0*	10.0±4.3	27.3± 8.5	0	0	0	0
August										
5	10.4±3.7	4.3±0.9*	5.1±2.5*	0.9±3.2*	10.0±3.2	27.5± 5.9	0	0	0	0
12	13.8±3.6	4.9±1.7*	2.8±2.2*	1.1±1.7*	10.0±4.0	31.5±10.6	0	0	0	0
19	12.6±5.0	2.5±1.3*	2.9±1.0*	1.2±1.8*	10.4±2.7	27.5± 5.9	0	0	0	0
27	8.4±3.1	2.2±1.2*	1.9±1.6*	1.5±2.4*	10.7±3.1	23.0± 4.2	0	0	0	0
±	7.7±6.0	1.7±1.9	2.0±1.0	0.9±1.0	5.4±4.6	19.2± 8.3	0	0	0.009+0.03[b]	0

[a]based on ten animals per herd. [b]represents one horn fly on a single animal.
*significantly lower than untreated control. °significantly lower than Ml tags.
Cy - 6.0% cypermethrin tags, D - 11.0% diazinon tags, C - untreated control.
Ml - tags with a mixture of 9.6% diazinon and 6.0% cypermethrin. Mh - tags with a mixture of 11.0% diazinon and 6.0% cypermethrin. d - ± = Mean.

Diseases of Ornamentals and Greenhouse

Maladies des plantes ornementales et de serre

Edited by / Révisé par
J. Matteoni

CROP: Chrysanthemum cv. Manatee Iceberg

PEST: Western flower thrips, Frankliniella occidentalis (Pergande)

TITLE: RESIDUAL TOXICITY OF SELECTED INSECTICIDES TO WESTERN FLOWER THRIPS

MATERIALS: AVID 0.15 EC (abamectin), CARZOL 92 SP (formetanate hydrochloride), DECIS 2.5 EC (deltamethrin), LORSBAN 50 WP (chlorpyrifos), TALSTAR 10 WP (bifenthrin), THIODAN 50 WP (endosulfan), TRUMPET 76 WP (bendiocarb).

METHODS: In efficacy tests, replicated three times, five-week old potted chrysanthemum plants, standardized to five top leaves were sprayed to run-off with various rates (see table) of each product, using a DeVilbiss gun at 100 kPa. Check plants were sprayed with distilled water. Plants were left to dry for 1 hour. Adult western flower thrips reared on chrysanthemums and marigolds, were collected with an aspirator, and placed singly in mesh covered clip cages (2.3 cm^3) which in turn were attached onto the treated plants. At first, six thrips were used per treatment but in the two following replications ten thrips per treatment were used. Plants were kept at 26°C and 70% RH. Thrips were assessed as alive, dead or missing at 24, 48, 72, and 144 hours after treatment.

NAME AND AGENCY:
BROADBENT, A.B. and KELLY, R.F.
Agriculture Canada, Research Station
VINELAND STATION, Ontario
LOR 2E0

RESULTS: Results are summarized in the table below.

CONCLUSIONS: The most effective control of F. occidentalis was provided by LORSBAN, an organophosphorus compound at both rates tested and by CARZOL, a carbamate compound. TRUMPET, a slower-acting carbamate, displayed greater than 90% mortality at 144 hours (6 days) after treatment. After 6 days, all treatments exhibited significantly higher thrips mortality than the check. Treatments showing greater than 90% mortality at 6 days were DECIS 4x and AVID 8x. It was evident that AVID is a slow-acting insecticide and requires greater than 72 h for adequate assessment.

Treatment	Rate g a.i./L	Percentage Mortality at Post-treatment Intervals[1] 24h	48h	72h	144h
Lorsban 4x	3.84	100 a[2]	100 a	100 a	100 a
Lorsban 1x	0.96	90.0 a	96.7 a	96.7 a	100 a
Carzol 4x	1.36	96.7 a	100 a	100 a	100 a
Trumpet 4x	2.4	14.8 b	40.3 bc	81.9 ab	91.7 a
Trumpet 1x	0.6	19.4 b	36.1 bc	57.5 bc	95.8 a
Thiodan 4x	2.0	24.1 b	53.3 b	63.7 bc	88.9 a
Decis 4x	0.04	8.9 b	17.9 bc	50.4 bc	100 a
Avid 8x	0.04	6.7 b	35.6 bc	45.6 bc	96.7 a
Avid 4x	0.02	8.3 b	24.2 bc	30.8 cd	82.2 a
Avid 1x	0.005	3.7 b	10.7 bc	24.4 cd	89.6 a
Talstar 4x	0.4	22.9 b	33.2 bc	40.6 c	78.3 a
Check		0.0 b	4.2 c	7.9 d	27.8 b

[1] Data transformed to arcsine $\sqrt{x}$ prior to ANOVA; untransformed means presented in table.
[2] Means followed by the same letter, in each column, are not significantly different (P = 0.05) Student-Neuman-Keuls test.

CROP: Greenhouse Ornamentals

PEST: Western flower thrips, Frankliniella occidentalis (Pergande)

TITLE: COMBINED CONTACT AND RESIDUAL TOXICITY OF SELECTED INSECTICIDES TO WESTERN FLOWER THRIPS

NAME AND AGENCY:
BROADBENT, A.B. and KELLY, R.F.
Agriculture Canada, Research Station
VINELAND STATION, Ontario
LOR 2E0

MATERIALS: AVID 0.15 EC (abamectin), AMBUSH 50 EC (permethrin), CARZOL 92 SP (formetanate hydrochloride), DECIS 2.5 EC (deltamethrin), LORSBAN 50 WP (chlorpyrifos), TALSTAR 10 WP (bifenthrin), THIODAN 50 WP (endosulfan), TRUMPET 76 WP (bendiocarb).

METHODS: A Potter spray tower was used to assess the contact and residual toxicity of various insecticides to thrips. Thrips were collected from chrysanthemums in a laboratory rearing facility. Thrips were immobilized with carbon dioxide (3.5 L/min for 10 secs) and five adults placed per glass petri dish (9 cm diam.) lined with 9 cm filter paper. Each dish was sprayed with 5.0 ml of product at various rates (see table) in a Potter spray tower. The air flow rate was 10 L/min with a spraying deposit time of 10 seconds. Check dishes were sprayed with distilled water. A 1 cm disc of chrysanthemum leaf was placed in each petri dish as a food source. The sides of the dishes were wiped dry of excess moisture and were sealed with Parafilm; then kept at 26°C and 70% RH. A moist environment was maintained by placing a damp cotton wick in each dish after 48 h. A fresh leaf disc was provided after 72 h. Five petri dishes per treatment were replicated over time in three separate tests. The mean mortality of thrips was assessed at 24, 48, 72, and 144 hours after treatment.

RESULTS: Results are summarized in the table below.

CONCLUSIONS: LORSBAN 1x provided the most immediate and effective control of thrips, 100% mortality within 48 h. TRUMPET 4x and THIODAN 4x were not significantlyl different from LORSBAN at 72 h after treatment and are considered effective products. Six days after treatment only THIODAN 4x, TRUMPET 4x, and AVID 8x provided greater than 90% mortality of thrips. The synthetic pyrethroids, particularly DECIS 4x and TALSTAR 4x were ineffective. It was evident that AVID is a slow-acting insecticide and requires greater than 72 h for adequate assessment.

Treatment	Rate g a.i./L	Perecentage Mortality at Post-Treatment Intervals[1] 24h	48h	72h	144h
Lorsban 1x	0.96	97.3 a[2]	100 a	100 a	100 a
Trumpet 4x	2.4	74.7 b	84.0 b	89.3 ab	97.3 ab
Trumpet 1x	0.6	34.8 de	50.7 cd	67.3 bcd	72.8 bcde
Carzol 4x	1.36	66.4 bc	70.5 bc	73.2 bc	76.2 abcd
Thiodan 4x	2.0	44.1 cd	72.1 bc	90.2 ab	100 a
Avid 8x	0.04	14.9 efg	20.4 ef	51.9 cde	95.9 abc
Avid 4x	0.02	4.3 fg	8.7 ef	26.9 ef	79.5 abcd
Avid 1x	0.005	4.1 fg	4.1 ef	20.3 ef	62.4 cdef
Ambush 4x	0.4	22.1 def	33.1 de	35.9 def	49.8 def
Decis 4x	0.04	11.1 efg	19.2 ef	20.6 ef	33.6 ef
Talstar 4x	0.4	5.5 fg	13.7 ef	23.3 ef	47.9 def
Check		1.4 g	4.2 f	8.3 f	26.4 f

[1] Data transformed to arcsine $\sqrt{x}$ prior to ANOVA; untransformed means presented in table.
[2] Means followed by the same letter, in each column, are not significantly different (P = 0.05) Student-Neuman-Keuls test.

CROP: Choke cherry, Prunus virginiana melanocarpa (A. Nels.) Sarg.

PEST: Prairie tent caterpillar, Malacosoma californicum lutescens (N. & D.).

TITLE: EVALUATION OF INSECTICIDES FOR THE CONTROL OF PRAIRIE TENT CATERPILLAR ON CHOKE CHERRY

MATERIALS: SEVIN 50 WP (carbaryl), DECIS 5 F (deltamethrin), MALATHION 50 EC (malathion).

METHODS: The trial was conducted on a four year old choke cherry shelterbelt located on the PFRA Tree Nursery at Indian Head, Saskatchewan. Each treatment plot consisted of a free standing plant infested with at least one prairie tent caterpillar nest. The trial was replicated four times in a Randomized Block design. On May 22, a back-pack sprayer equipped with a Tee-Jet 8002 nozzle and operated at 225 kPa, was used to apply the treatments to the point of run-off. Check plots were treated with water only. The number of dead and alive larvae per plant was recorded 72 hours after spraying. An arcsin transformation of percent mortality was conducted prior to analysis of variance. Means were separated by a Duncan's Multiple Range test.

NAME AND AGENCY:
REYNARD, D.A. and NEILL, G.B.
Agriculture Canada
P.F.R.A. Tree Nursery
Indian Head, Saskatchewan SOG 2KO

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All insecticides caused significant mortality of prairie tent caterpillar larvae within 72 hours, as compared to the check.

Treatments		Rates (g ai/100 L)	Larvae/plant alive	dead	% mortality[1]
SEVIN	50 WP	125.0	2.0	65.5	91.3 a
DECIS	5 F	4.5	0.0	252.3	100.0 a
MALATHION	50 EC	50.0	0.0	107.0	100.0 a
Check		-	90.3	1.0	3.6 b

[1]Means followed by the same letter are not significantly different at the five percent level according to Duncan's Multiple Range test.

CROP: Cotoneaster, Cotoneaster integerrima Medic.

PEST: Lace bug, Corythucha sp.

TITLE: EVALUATION OF INSECTICIDES FOR CONTROL OF A LACE BUG ON COTONEASTER

MATERIALS: SEVIN 50 WP (carbaryl), CYGON 48 EC (dimethoate), and MALATHION 50 EC (malathion).

METHODS: The trial was conducted on a cotoneaster hedge at the PFRA Tree Nursery, Indian Head, Saskatchewan. Each treatment plot was five metres long and replicated four times in a Randomized Block design. On August 5, 1987, the treatments were applied to the point of run-off with a back sprayer equiped with Tee-Jet 8002 nozzle at 225 kPa. Forty-eight hours after application, 40 leaves were collected from each plot. Using binocular microscopes, the number of lace bug adults and nymphs per leaf was recorded. An $x+1$ transformation of the data was conducted prior to an analysis of variance. Means were separated by a Duncan's Multiple Range test.

NAME AND AGENCY:
REYNARD, D.A. and NEILL, G.B.
Agriculture Canada
P.F.R.A. Tree Nursery
Indian Head, Saskatchewan SOG 2KO

RESULTS: See table below.

CONCLUSIONS: All insecticides caused a significant reduction in numbers of lace bugs per leaf in comparison to the untreated check.

Treatment		Rate (g ai/100 L)	Lace bugs[1] per leaf
SEVIN	50.0 WP	100.0	0.01 b
CYGON	48.0 EC	48.0	0.13 b
MALATHION	50.0 EC	55.0	0.10 b
Check		-	2.36 a

[1]Means followed by the same letter are not significantly different at the five percent level according to Duncan's Multiple Range test.

CROP: Oak trees

PEST: Gypsy moth; Lymantria dispar

TITLE: EVALUATION OF PERMETHRIN FOR THE CONTROL OF GYPSY MOTH LARVAE ON OAK TREES, 1987

MATERIALS: C-I-L GARDEN INSECT KILLER AMBUSH® (12.5 g/L permethrin).

METHODS: This trial was conducted on 6m^2 areas of branch on eight randomly selected oak trees. Four of these areas received permethrin treatments, four were check treatments. C-I-L GARDEN INSECT KILLER AMBUSH® treatments were applied on June 16, 1987 with a back pack sprayer equipped with a flood jet nozzle delivering 1000 L/ha spray solution spraying to runoff. Assessments were conducted 1 hour, 1 day, 6 days and 10 days after application by counting the number of gypsy moth larvae in each 6m^2 area.
Location: Castleton, Ontario

NAME & AGENCY

McLEAR, M.
Chipman, A Business Unit of C-I-L Inc.
400 Jones Road
Stoney Creek, Ontario
L8G 3Z1

RESULTS: The results are summarized in the table below.

CONCLUSIONS: C-I-L GARDEN INSECT KILLER AMBUSH® provided significant control of gypsy moth larvae compared to the untreated check. No phytotoxicity to the oak trees occurred from the treatment.

TREATMENT	RATE		NO. GYPSY MOTH LARVAE[1]				
	kg ai/ha	ppm	PRE SPRAY	1 HOUR AFTER TREATMENT	1 DAT[2]	6 DAT	10 DAT
C-I-L GARDEN INSECT KILLER AMBUSH®	0.0875	87.5	28	4 a[3] (85.7)[4]	2 a (94.3)	3 a (90)	2 a (91.7)
Untreated check	-	-	30	28 b	35 b	30 b	24 b

1. Average number of gypsy moth larvae per 6m^2 area of branch per treatment.
2. Days after treatment.
3. Treatment means in the same column with no letter in common are significantly different at the 5% level (t-test). Data has been square root transformed for analysis.
4. Percent control relative to the check.

CROP: Acute willow, Salix acutifolia Willd.

PEST: Willow sawfly, Nematus ventralis Say

TITLE: EVALUATION OF INSECTICIDES FOR CONTROL OF THE WILLOW SAWFLY ON WILLOW

MATERIALS: SEVIN 50 WP (carbaryl), DIAZINON 12.5 EC (diazinon), MALATHION 50 EC (malathion) and DECIS 5 F (deltamethrin).

METHODS: The trial was conducted on a five year old willow shelterbelt located at the PFRA, Tree Nursery, Indian Head, Saskatchewan. The trial was replicated four times in a Randomized Block design. Each treatment plot consisted of a single tree. Three branches infested with willow sawfly larvae were tagged in each treatment plot for pre- and post-spray counts. An untreated tree was left between each treatment plot to act as a buffer. On August 12, 1987, the treatments were applied to the point of run-off with a back-pack sprayer equipped with Tee-Jet 8002 nozzle at 225 kPa. Pre-spray counts were conducted on the morning of August 12 and post-spray counts 24 hours after spraying. The percent control was determined using Abbott's formula. An analyses of variance was conducted with means separated by the Duncan's Multiple Range test.

NAME AND AGENCY:
REYNARD, D.A. and NEILL, G.B.
Agriculture Canada
P.F.R.A. Tree Nursery
Indian Head, Saskatchewan SOG 2KO

RESULTS: See table below.

CONCLUSIONS: All insecticides caused a significant reduction of willow sawfly larvae in comparison to the check. The reduction in the check treatment was attributed to the migration of larvae searching for plant material.

Treatment		Rate (g ai/100 L)	Larvae/tree pre-spray	Larvae/tree post-spray	% Control[1,2]
SEVIN	50 WP	25.0	160.0	0.0	100.0 b
DIAZINON	12.5 EC	25.0	127.8	1.8	80.4 b
MALATHION	50 EC	50.0	121.0	0.0	100.0 b
DECIS	5 F	0.88	119.5	0.3	97.3 b
Check		-	150.0	33.0	0.0 a

[1]Percent control calculated using Abbott's formula.
[2]Means followed by the same letter are not significantly different at the five percent level according to Duncan's Multiple Range test.

Basic Studies on Insecticides

Études de base sur les insecticides

Edited by / Révisé par
A.D. Tomlin

CROP:

PEST:

TITLE: AN IMPINGEMENT PLATE TO DETECT PYRETHROID DEPOSITS

NAME AND AGENCY:

HILL, B. D. and D. J. INABA
Agriculture Canada Research Station
P. O. Box 3000, Main
Lethbridge, Alberta
T1J 4B1

MATERIALS: DECIS 5.0 FLO (deltamethrin)

METHODS: A simple monitoring method is required to check that unsprayed buffer zones are left around fish habitats, wetlands, and sloughs. Our objective was to develop an impingement plate that would trap and retain pyrethroid deposits for at least two weeks under field conditions. The plate could then be collected and subjected to residue analysis to detect the deposits. This research is described in detail in another publication (Hill and Inaba, 1988)†.

The impingement plate was a TLC sheet (Baker-flex® silica gel IB2-F, 7.5 x 2.5 cm) mounted onto a glass microscope slide using double-sided sticky tape. In the field, this unit was affixed to the top of a wooden stake using strip-caulk putty. An experiment was conducted near Taber, Alberta, in which deltamethrin was aerially applied on June 24, 1986, at 6 g ai/ha in 9.4 L water/ha, to two different pastures. Plates set out prior to spraying were sampled at 0, 3, 9, 21, and 36d after spraying. The 0-36d weather was warm (mean max./min. 24.1/9.7°C) and sunny (12.3 h/d), with the wind run >500 km/d on 2d, and 63.8 mm of rainfall recorded over 15d. Collected plates were analyzed using acetone-hexane extraction and ^{63}Ni-GLC detection. Method recovery was estimated at 87.5% with a minimum quantifiable limit of 0.005 µg/plate.

RESULTS: See Table below. Deltamethrin deposits were still readily detectable 21d after spraying, but by 36d, levels of deltamethrin were only marginally above the unsprayed controls.

CONCLUSIONS: The impingement plate successfully trapped and retained deposits from a direct overspray of deltamethrin. This plate could be used in a monitoring system for pyrethroids.

Days after application	Deltamethrin detected (µg/plate)*	
	Pasture 1	Pasture 2
0	0.78	1.09
3	0.49	0.81
9	0.19	0.23
21	0.012	0.018
36	0.007	0.005
controls**	0.004	0.003

*Each value is a mean of 4 plates. The theoretical 0-day deposition was 0.94 µg/plate.
**Estimated by extrapolation of the GC standard curve.

†Hill, B.D. and D.J. Inaba. 1988. An impingement plate method to detect deposits of pyrethroid insecticides. J. Environ. Sci. Health B23: in press.

CROP:

PEST:

TITLE: EFFECT OF FORMULATION ON THE PERSISTENCE OF DELTAMETHRIN IN SOIL

MATERIALS: DECIS 5.0 EC, 2.5 FLO (deltamethrin)

METHODS: The experiment was conducted on Lethbridge sandy clay loam (OM 2.2%, pH 7.9, CEC 20.1 mequiv./100g, MHC 18.8% at 30 kPa). On June 11, 1986, an indoor track sprayer with a Delavan® LE-1 80° nozzle was used to apply the two formulations at 10 g ai/ha in 125 L/ha water volume to the soil contained in galvanized metal flats (50L x 35W x 9D cm). Within 2h of spraying, the flats were moved outdoors and dug-into a fallow field so that the top of the flat was level with the field. The experiment consisted of five replicates per formulation, plus four unsprayed controls, arranged in a completely randomized design. The soil was sampled at 0, 0.5, 1, 2, 4, 8, 12, and 16 wk after spraying by taking four soil cores (0-2.5 cm x 2.36-cm dia.) per flat across the spray pattern. Samples were analyzed using a ^{63}Ni-GLC residue analysis method. To estimate disappearance times for the first 50% (DT_{50}) and 90% (DT_{90}) of residue, a two-compartment model (2CM)† was fit to the data.

NAME AND AGENCY:

HILL, B. D. and D. J. INABA
Agriculture Canada Research Station
P. O. Box 3000, Main
Lethbridge, Alberta
T1J 4B1

RESULTS: See Table below. Deltamethrin dissipation was biphasic, thus the commonly used first-order model did not fit the data. The 2CM gave a good fit to the EC (r^2=0.94) and the FLO (r^2=0.97) residue data. The biphasic dissipation curves for the two formulations were significantly different (P<0.01).

CONCLUSIONS: The rate of deltamethrin dissipation in Lethbridge soil was slower when the FLO formulation was applied.

Weeks after application	Deltamethrin residues remaining in the soil*			
	EC Formulation		FLO Formulation	
	µg/sample**	% basis	µg/sample**	% basis
0	1.52	100	1.23	100
0.5	1.11	73	1.01	82
1	1.05	69	0.92	75
2	0.85	56	0.77	63
4	0.51	33	0.54	44
8	0.37	24	0.40	33
12	0.23	15	0.28	23
16	0.19	12	0.21	17
	DT_{50} = 2.3 wk DT_{90} = 17.2 wk		DT_{50} = 3.4 wk DT_{90} = 23.1 wk	

*Each value is a mean of 5 replicates.
**Total µg per four soil cores, i.e. µg/17.5 cm^2.

†Hill, B. D. and G. B. Schaalje. 1985. A two-compartment model for the dissipation of deltamethrin on soil. J. Agric. Food Chem. 33:1001-1006.

CROP:

PEST: Pale western cutworm, Agrotis orthogonia Morr.

TITLE: INSECTICIDE MODE OF CONTACT AGAINST SUBTERRANEAN CUTWORMS

MATERIALS: DECIS 5.0 EC (deltamethrin), LORSBAN 4E (chlorpyrifos)

METHODS: This laboratory experiment was conducted to determine whether pale western cutworm, primarily a subterranean species, must come to the surface of treated soil for toxicity to occur. Galvanized metal flats (50L x 35W x 9D cm) were filled with moist, sieved, Lethbridge loam and 25 lab-reared cutworms (ultimate and penultimate instar) were introduced below the soil surface of each flat several hours before spraying. Larvae that appeared about to molt were not used because such larvae are relatively inactive. In half of the flats, the cutworms were prevented from surfacing by a metal screen located 1.0 cm below the surface. Flats without a sub-surface screen had a 5.0-cm high edge barrier to retain cutworms that surfaced. An indoor track sprayer with a TeeJet® 8001E nozzle was used to apply the insecticides in 125 L water/ha. All cutworms were below the soil surface at time of spraying. Each treatment was replicated four times in a completely randomized design. After spraying, treatments were held indoors under natural photoperiod at 17-21°C. Assessments were made after 48 h by sieving the soil in each flat to recover dead, moribund, and live cutworms. Soil moisture at the 0-2.5 cm depth was 6.5% at 0h, drying to 3.8% at 48h; at the 2.5-5.0 cm depth, it was 16.2% at 0h, drying to 13.2% at 48h. Percent mortality data were subjected to analysis of variance and differences between screened and unscreened treatments were evaluated using single degree of freedom contrasts.

RESULTS: See Table below. Mortality may have increased with increased time after treatment (especially for Lorsban), however, assessments were made at 48h to limit cannibalism in the screened treatments.

CONCLUSIONS: For contact toxicity, pale western cutworms must come to the surface of Decis-treated soil. Because of the low mortality by 48h with Lorsban, no conclusions were drawn for this insecticide.

NAME AND AGENCY:

HILL, B. D. and J. R. BYERS
Agriculture Canada Research Station
P. O. Box 3000, Main
Lethbridge, Alberta
T1J 4B1

Treatment	Rate (g ai/ha)	Unscreened or Screened	Mean No. Cutworms Recovered*	Mean Percent Mortality**	Screened vs Unscreened P-value
DECIS	10	Unscreened	24	65	
DECIS	10	Screened	21	2	<0.01
LORSBAN	680	Unscreened	22	15	
LORSBAN	680	Screened	19	5	0.10
Control	-	Unscreened	25	0	
Control	-	Screened	22	2	-

*Initial no. cutworms was 25 per flat. Losses were due to cannibalism.
**Percent mortality = 100 x (moribund + dead)/no. cutworms recovered.

CROP:

PEST: Pale western cutworm, Agrotis orthogonia Morr.

TITLE: EFFECT OF CUTWORM MOLTING-STAGE ON INSECTICIDE EFFICACY

MATERIALS: DECIS 5.0 EC (deltamethrin)

METHODS: This laboratory experiment was conducted to determine whether pre- or post-molt condition of the pale western cutworm affects the efficacy of deltamethrin applied to the soil surface. The hypothesis was that cutworms about to molt would be poorly controlled initially because they are relatively inactive and remain below the soil surface until after molting. Pre-and recent post-molt cutworms were selected from a lab-reared population a few hours prior to spraying. Galvanized metal flats (50L x 35W x 9D cm) were filled with moist, sieved, Lethbridge loam and 20 cutworms (ultimate and penultimate instar) were introduced to each flat. All flats had a 5.0-cm high edge barrier to retain cutworms that surfaced. An indoor track sprayer with a TeeJet® 8001E nozzle was used to apply the insecticide in 125 L water/ha. All cutworms were below the soil surface at time of spraying. Each treatment was replicated four times in a completely randomized design. After spraying, treatments were held indoors under natural photoperiod at 17-21°C. Assessments were made after 2d and 6d by sieving the soil in each flat to recover dead, moribund, and live cutworms. Soil moisture at the 0-2.5 cm depth was 5.9% at 0d, drying to 3.2% at 2d and 4.0% at 6d; at the 2.5-5.0 cm depth, it was 12.6% at 0d, drying to 11.2% at 2d and 10.0% at 6d. Percent mortality data were subjected to analysis of variance and differences among treatments were evaluated using a t-test.

NAME AND AGENCY:

HILL, B. D. and J. R. BYERS
Agriculture Canada Research Station
P. O. Box 3000, Main
Lethbridge, Alberta
T1J 4B1

RESULTS: See Table below. Almost all the cutworms were recovered from all treatments (mean = 19/20), indicating a low level of cannibalism.

CONCLUSIONS: Cutworms in a pre-molt condition at the time of deltamethrin treatment are relatively inactive and are poorly controlled for at least 2d. Once they have molted and become active again, these cutworms are controlled to the same extent as the rest of the population. In the field, up to 40% of a population may be in the pre-molt stage at any one time; therefore assessment of efficacy within 2d of spraying can be misleading.

Treatment	Rate (g ai/ha)	Cutworm Molting-Stage	Mean Percent Mortality* 2 day	6 day
DECIS	10	unselected	69 a	87 c
DECIS	10	pre-molts	30 b	83 c
DECIS	10	post-molts	70 a	91 c
Control	-	unselected	0	4

*Percent mortality = 100 x (moribund + dead)/no. cutworms recovered. Means followed by the same letter are not significantly different (P>0.05).

CROP: Horticultural Crops

PEST: Insects of horticultural crops

NAME AND AGENCY:
TU, C.M.
Research Centre, Agriculture Canada
University Sub Post Office
London, Ontario N6A 5B7

TITLE: EFFECT OF SOME CANDIDATE INSECTICIDES ON MICROBIAL POPULATIONS AND RESPIRATION IN ORGANIC SOIL.

MATERIALS: Technical (>93% purity) tefluthrin, trimethacarb, DOWCO 429X, and SD208304 (78% purity)

METHODS: Ten micrograms active ingredient of insecticide per gram of soil were dissolved in pentane-acetone (1:1) mixture and incorporated with carrier sand. The sand-insecticide mixture was incorporated with muck soil by tumbling for 30 min. Changes in the soil microfloral numbers were determined by soil dilution plate technique using rose-bengal streptomycin agar for fungi and sodium albuminate agar for bacteria and streptomyces. Soil moisture was maintained at 60% moisture-holding capacity. Samples were incubated at 28°C for periods of two and four wk after treatment. Microorganisms are active in the transformation of organic matter in the soil and soil respiration is an index of the activity of microflora involved in organic matter decomposition. In the soil respiration experiment, triplicate samples of insecticide-treated and insecticide-untreated soils were measured for cumulative oxygen consumption at 30°C for a period of 88 h using a Gilson differential respirometer. Duncan's multiple range test was used in statistical analysis of the results.

RESULTS: Results are summarized in the table below.

CONCLUSIONS: Microbial populations were equal to or greater than control after 4 wk, and none of the chemicals appeared to drastically reduce oxygen consumption. These results suggest that there were no inhibitory effects of the insecticides on the numbers or biomass of microorganisms and their activities in organic matter decomposition.

Treatment	Insecticide Treatment Rate (µg/g)	Bacteria ($x10^5$g) Period of Incubation 2 wk	Bacteria ($x10^5$g) Period of Incubation 4 wk	Fungi ($x10^3$g) Period of Incubation 2 wk	Fungi ($x10^3$g) Period of Incubation 4 wk	Respiration (10/g) 64 h	Respiration (10/g) 88 h
Control	0	26 bc*	24 bc	60 ab	46 bc	454 bcd	603 d
Tefluthrin	10	31 ab	36 a	49 cd	43 bc	496 bc	651 bc
Trimethacarb	10	14 e	33 a	35 fg	61 a	495 bc	651 bc
Dowco 429x	10	25 bc	25 b	44 de	39 bcd	469 bcd	619 bc
SD208304	10	21 cd	25 b	38 fg	42 bc	524 a	704 a

* within each column, mean values followed by the same letter are not significantly different at the 5% level

CROP: Horticultural Crops

PEST: Insects of horticultural crops

NAME AND AGENCY:
TU, C.M.
Research Centre, Agriculture Canada
University Sub Post Office
London, Ontario N6A 5B7

TITLE: EFFECT OF EXPERIMENTAL INSECTICIDES ON MICROBIAL ACTIVITY IN SANDY SOIL

MATERIALS: Technical (>93% purity) tefluthrin, trimethacarb, DOWCO 429X, and SD208304 (78% purity)

METHODS: Insecticides were applied to the soil at 10 µg active ingredient per gram of soil using carrier sand. Samples were incubated at 28°C and moisture was maintained at 60% moisture holding capacity. The degradation of proteins and other complex nitrogenous components of organic matter is carried by the saprophytes in the soil. The ammonification activity was determined by measuring NH_3 evolution resulting from employing steam distillation. The biological formation of nitrite and nitrate from ammonium-N in soil is carried out by nitrifying microorganisms. Soil nitrification was determined by phenoldisulfonic acid method for nitrates at 430 nm and nitrites by the diazotization method with sulfanilic acid, -naphthylamine hydrochloride and sodium acetate buffer at 525 nm. A large fraction of sulfur in the soil profile is in organic forms. Microbial decomposition is required to make the sulfur available for uptake from the soil. Level of sulfur oxidation was determined turbidimetrically in the soil extracts at 429 nm for sulfate. Untreated controls were included with all tests. All results are expressed on an oven-dry basis and are means of triplicate determinations. Duncan's multiple range test was employed for statistical analyses of the results.

RESULTS: Results are summarized in the table below.

CONCLUSIONS: Insecticides stimulated ammonification of soil microbial populations following 2 wk of incubation. These effects, although significantly different from control, were not sufficient to be considered deleterious to soil microbial activities important to soil fertility.

Treatment	Insecticide Treatment Rate (µg/g)	Ammonification		Nitrification		Sulfur oxidation	
		Period of Incubation					
		1 wk	2 wk	1 wk	2 wk	1 wk	2 wk
Control	0	22 a*	22 c	17 a	21 a	18 ab	23 bcd
Tefluthrin	10	22 a	32 b	5 e	20 a	19 ab	27 a
Trimethacarb	10	22 a	43 a	6 cde	22 a	15 b	26 ab
Dowco 429x	10	21 a	43 a	16 a	22 a	18 ab	25 ab
SD208304	10	22 a	43 a	15 ab	21 a	21 a	25 ab

*values within each column indicated by the same letter are not significantly different at the 5% level

CROP: Potatoes

PEST: Colorado potato beetle (CPB)
Leptinotarsa decemlineata (Say)

TITLE: LABORATORY SCREENING TESTS FOR MONITORING INSECTICIDE RESISTANCE OF COLORADO POTATO BEETLE

NAME AND AGENCY:
TURNBULL, S.A.
Research Centre, Agriculture Canada
University Sub Post Office
London, Ontario N6A 5B7

MATERIALS: Technical (>95% purity) carbofuran, deltamethrin, fenvalerate, cypermethrin, azinphosmethyl, oxamyl (each dissolved in 19:1 acetone:olive oil).

METHODS: CPB were collected from various potato fields in Ontario, and reared (if larvae) to adults for testing. Some were also sent from PEI and New Brunswick (NB). Bioassays were done using a Potter spray tower. Two replicates of 10 adults were sprayed with 5 ml insecticide solution at each concentration and the test repeated if enough beetles were available. A range of concentrations was chosen to cause 0-100% mortality (up to 1.0% solution). Mortality was assessed at 24 and 48 h and compared to an insecticide-susceptible strain (LS) of CPB kept under continuous culture at the London Research Centre.

RESULTS: The 24 h mortality data are presented in the table below.

CONCLUSIONS: Five potato fields out of 7 surveyed contained CPB that had a resistance level to carbofuran more than 100-fold higher than the LS strain. One collection of CPB from Alliston, Ontario was a mixture of susceptible and resistant individuals that had developed some carbofuran resistance, whereas CPB from a site in PEI were susceptible to carbofuran. Tests of pyrethroid insecticides indicated that CPB collected from various locations in Ontario as well as from one site in PEI and one in NB have developed resistance (from 2-10 fold) to deltamethrin, fenvalerate, or cypermethrin. In several field-collected samples, a 10-fold level of pyrethroid resistance over the LS strain is the highest noted in Ontario to date. Two groups of beetles (Thedford-A and Alliston-2) were susceptible to fenvalerate. CPB from a field in Alliston were susceptible to azinphosmethyl but this compound was less toxic to CPB collected from the Sarnia area. Susceptibility to oxamyl of CPB from a Thedford field changed with age. CPB in Ontario have developed resistance to several insecticides, but development and level of resistance vary from field to field.

DIRECT CONTACT TOXICITY OF SELECTED INSECTICIDES TO ADULT COLORADO POTATO BEETLES

Insecticide	Strain	Average corrected % mortality at indicated % solution								Approx. Toxicity Index
		.00033	.001	.0033	.01	.033	.1	.33	1.0	
carbofuran	LS			3	33	100	100	100	100	
	Thedford-A				0	5	15	10	5	> 100x
	Alliston-1			0	60	80	80	80	85	*
	Alliston-2					0	0	3	0	> 100x
	Sarnia						5	0	0	> 100x
	Alliston-3							15	0	> 100x
	Thedford-B						25	35	30	> 100x
	PEI			0	50	100	100	100	100	< 1x
deltamethrin	LS	43	83	93	100	100	100			
	Harrow	0	30	0	95	100				10x
	Thedford-A		50	65	85	95	100			10x
	Alliston-1		0	70	95					5x
	Alliston-2		0	95	100	100	100			3x
	Sarnia		5	60	95	100	100			6x
	Thedford-B		60	90	100					2x
fenvalerate	LS			0	60	75	93	100		
	Thedford-A				60	70	100	100		< 2x
	Alliston-2			0	30	100	100	100		1x
	Sarnia				15	15	45			10x
	PEI				0	20	15	90	100	8x
	NB				0	0	15	70		10x
cypermethrin	LS		3	65	100	100	100			
	Sarnia				0	65	100	100		10x
	Harrow				20	80	100			8x
azinphos-methyl	LS					0	52	60	100	
	Alliston-2					0	10	100		< 1x
	Sarnia			15	0	5	5	20	85	3x
oxamyl	LS						0	50	100	
	Thedford-B[1]						0	55	100	1x
	Thedford-B[2]						10	0	70	2x

*cannot estimate because of heterogeneous sample; [1]less than 1 wk old; [2]approximately 3 wk old

Diseases of Fruit Crops

Maladies des fruits

Edited by / Révisé par
A.R. Biggs; J. Northover

CROP: Apple var. Red Delicious

PEST: Apple scab, Venturia inaequalis (Cke.) Wint.

TITLE: EVALUATION OF NUSTAR FOR CONTROL OF APPLE SCAB

MATERIALS: NUSTAR DF (DPX H 6573 20%), BENLATE WP (benomyl 50%), MANZATE 200 WP (maneb 80%).

METHODS: Treatments were applied to single tree plots with a hand gun at a pressure of 700 kPa to runoff (3000 L/Ha). Plots were replicated 3 times in a nonrandom design. MANZATE and BENLATE were applied as a tank-mix at 0.275 + 2.6 kg ai/ha weekly from May 2 - June 15 during the primary infection period. NUSTAR at 20, 40, and 60 g ai/ha was applied May 2, 16, and 29, and June 15. MANZATE at 4 kg ai/ha was applied as a cover spray to all plots on July 6 and 20, and August 3 and 17. An insecticide was applied on June 5 and miticides were applied on June 22. Seventy-five fruit and 100 leaves per treatment were inspected for scab lesions (presence/absence) on June 16 and September 11.

NAME AND AGENCY:
JOTCHAM, J.R. and ROGERS R.E.L.
Marbicon Biological Consultants
P.O. Box 900, Berwick, Nova Scotia B0P 1E0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All fungicide treatments provided excellent control with very little detectable scab. Although unusually dry weather resulted in few infection periods, the check plots exhibited more scab on fruit and foliage in September than any other treatment.

Location: Woodville, Nova Scotia

		PERCENT SCAB LESIONS			
		Fruit		Foliage	
TREATMENT	RATE (kg ai/ha)	June 16	September 11	June 16	September 11
NUSTAR	0.02	0	0	0	0
NUSTAR	0.04	0	0	0	0
NUSTAR	0.06	0	0	0	0
MANZATE + BENLATE	2.6 + 0.275	0	0	0	0
CHECK	-	0	7.14	0	2.00

CROP: Apple var. McIntosh

PEST: Apple scab, Venturia inaequalis (Cke.) Wint.

TITLE: EVALUATION OF NUSTAR, BENLATE 50 DF, AND MANZATE 200 DF FOR CONTROL OF APPLE SCAB

MATERIALS: NUSTAR DF (DPX H 6573 20%), BENLATE 50 DF (benomyl 50%), BENLATE WP (benomyl 50%), MANZATE 200 DF (maneb 75%), MANZATE 200 WP (maneb 80%).

METHODS: Treatments were applied to single tree plots with a hand gun at a pressure of 700 kPa to runoff (3000 L/Ha). Plots were replicated 3 times in a nonrandom design. MANZATE DF + BENLATE DF and MANZATE WP + BENLATE WP were applied as tank-mixes at 2.6 + 0.275 kg ai/ha weekly from May 2 - June 15 during the primary infection period. NUSTAR at 20, 40, and 60 g ai/ha was applied May 2, 16, and 29, and June 15. MANZATE at 4 kg ai/ha was applied as a cover spray to all plots on July 6 and 20, and August 3 and 17. MANZATE DF was used on the MANZATE DF + BENLATE DF plots. An insecticide was applied on June 5 and miticides were applied on June 22. Seventy-five fruit and 100 leaves per treatment were inspected for scab lesions (presence/absence) on June 16 and September 11.

Location: Woodville, Nova Scotia

NAME AND AGENCY:
JOTCHAM, J.R. and ROGERS R.E.L.
Marbicon Biological Consultants
P.O. Box 900, Berwick, Nova Scotia B0P 1E0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All fungicide treatments provided excellent control with very little detectable scab. Although unusually dry weather resulted in few infection periods, the check plots exhibited more scab on fruit and foliage than any other treatment.

		PERCENT SCAB LESIONS			
	RATE	Fruit		Foliage	
TREATMENT	(kg ai/ha)	June 16	September 11	June 16	September 11
NUSTAR	0.02	1.00	0	0	2.00
NUSTAR	0.04	0	0	1.00	0
NUSTAR	0.06	0	1.33	0	0
MANZATE DF + BENLATE DF	2.6 + 0.275	0	0	0	0
MANZATE WP + BENLATE WP	2.6 + 0.275	0	0	1.00	2.00
CHECK	-	3.00	56.00	4.00	52.00

CROP: Apple, cv. McIntosh and Cortland

PEST: Apple scab, Venturia inaequalis

TITLE: EVALUATION OF FUNGICIDES FOR CONTROL OF APPLE SCAB, 1987

MATERIALS: ACR 3815 70 WP (3.3% pyrifenox + 66.7% mancozeb), BAYCOR 50 WP (bitertanol), DITHANE M-45 80 WP (mancozeb), MANZATE 200 75 DF (mancozeb), NUSTAR 20 DF (DPX H 6573), POLYRAM 80 WP (metiram), PP 523 F (hexaconazole), RH 3866 60 DF (myclobutanil), TOPAS/MZ 61 WP (penconazole).

METHODS: Treatments were applied to single tree plots with a hand-held gun at a pressure of 2100 kPa to run-off (approximately 3000 litres per hectare). Fungicides were tested in a 25-year old apple orchard using a row and column block design with 4 single trees for each spray regime. Row blocks were formed by adjacent rows of each variety. Treatments were applied on April 27, May 6 and 19 - 20, June 1, 12-13 and 23, July 6, 17 and 30. Except for the first treatments on April 27th the 2nd to 9th treatments followed infection periods by 1-2, 4, 3, 5, 5, 2, 2 and 4 days, respectively. There was 1 infection period in April, 7 in May, 10 in June, 6 in July and 4 in August. Foliage scab was recorded on July 6-8 on 500 leaves per tree and fruit scab was recorded on 300 apples per tree at harvest for McIntosh and Cortland.
Location: Kentville, Nova Scotia

NAME AND AGENCY:
LOCKHART, C. L. and NEWBERY, R. J.
Agriculture Canada, Research Station
KENTVILLE, Nova Scotia B4N 1J5

RESULTS: The scab and russet results are shown on the table below. Star-cracking injury of 32% on McIntosh and 27% on Cortland was found in the PP 523 plots. A considerable number of the scab lesions in the NUSTAR plots were of the halo type and were fungistatic. There was no late scab.

CONCLUSIONS: As a result of the extreme scab pressure experienced in these tests, the after infection delay of 5 days for sprays 5 and 6 and tolerance to BAYCOR and suspected increased tolerance to NUSTAR, both of these treatments failed to give satisfactory scab control. MANZATE 200 DF, the addition of mancozeb in the formulations of ACR 3815, TOPAS/MZ and the combination of RH 3866 and DITHANE M-45 gave satisfactory scab control. Tank mix of BAYCOR and POLYRAM gave good control of scab. The treatment, PP 523 followed by DITHANE M-45 in the cover sprays injured the apples causing a star-cracking condition. An overall improved fruit finish was observed when mancozeb was included in the treatments.

Treatment	Rate kg ai/ha	% SCAB McIntosh Foliage	McIntosh Fruit Total	Cortland Foliage	Cortland Fruit Total	% Russet McIntosh	% Russet Cortland
BAYCOR 50 WP	0.250	67.1 a*	99.4 a	67.3 a	96.4 a	18.1 a	5.1 cd
BAYCOR 50 WP + POLYRAM 80 WP	0.125 2.640	9.2 d	7.2 de	22.2 c	6.1 d	18.6 a	10.3 bc
NUSTAR 20 DF to calyx then MANZATE 200 75 DF in cover sprays	0.020 4.000	46.9 b	54.9 b	32.1 b	30.4 b	14.6 ab	5.1 cd
NUSTAR 20 DF to calyx then MANZATE 200 75 DF in cover sprays	0.040 4.000	31.8 c	39.8 c	33.2 b	39.6 b	12.3 ab	9.4 bc
NUSTAR 20 DF to calyx then MANZATE 200 75 DF in cover sprays	0.060 4.000	25.4 c	34.5 c	17.0 cd	16.2 c	13.0 a	6.0 bcd
MANZATE 200 75 DF to calyx, in cover sprays	5.400 4.000	6.9 de	1.0 fg	3.9 fg	2.9 de	10.0 b	8.6 bc
TOPAS/MZ 61 WP	2.745	9.0 d	5.2 ef	6.8 ef	2.5 de	12.3 ab	10.9 bc
RH 3866 60 DF + DITHANE M-45 80 WP	0.135 2.720	4.9 def	4.9 efg	12.1 de	7.7 cd	11.1 b	6.9 bcd
RH 3866 60 DF + DITHANE M-45 80 WP	0.105 2.720	2.1 fgh	4.7 efg	1.3 fg	2.8 de	14.0 ab	7.8 bcd
RH 3866 60 DF + DITHANE M-45 80 WP	0.075 2.720	7.4 de	4.7 efg	2.9 fg	3.5 de	13.3 ab	9.0 bc
ACR 3815 70 WP	2.800	0.7 h	0.7 g	0.6 g	2.8 de	13.1 ab	11.5 b
ACR 3815 70 WP	3.150	1.0 gh	1.6 fg	0.0 g	0.7 e	8.2 b	3.4 d
PP 523 5 F to calyx, then PP 523 5 F + DITHANE M-45 80 WP in cover sprays	0.040 0.020 2.500	3.5 efg	14.1 d	3.6 fg	7.0 d	19.3 a	25.7 a
SEM(n=4,d.f.=51)**		2.04	2.79	2.04	2.79	2.21	2.21
CHECK***		84.9	100.	72.3	99.7		

*Back transformed mean angle. Treatments followed by the same letter do not differ significantly by Fisher's protected LSD at the 5% level.
**Standard error of mean angle.
***Observational and not included in plot design.

CROP: Apples cv McIntosh

PEST: Apple Scab, Venturia inaequalis

TITLE: EVALUATION OF TOPAS MZ61 FOR APPLE SCAB CONTROL

MATERIALS: POLYRAM 80 (metiram), TOPAS MZ61 (penconazole + mancozeb)

METHODS: Plots in 1987 consisted of two McIntosh apple trees on 0-6 rootstocks that were 18 years old. The plots were replicated four times and were arranged in a randomized block design. Fungicides were applied with a handgun operating at 1035 kPa delivering 3200 L water/ha. Applications began at greentip (April 24) and were carried out on a 10 day schedule until August 19. Scab assessments were made by rating all the leaves on 10 terminal shoots per tree and 20 fruit on two separate occasions (July 10 and September 10). These ratings were expressed as a percent infected.

NAME AND AGENCY:
MORTON, J.
Kemptville College of Agricultural Technology
Kemptville, Ontario KOG 1JO

RESULTS: Results are summarized in the table below.

CONCLUSIONS: TOPAS and POLYRAM applications made on a full season schedule gave significantly better control of the apple scab fungus Venturia inaequalis than the unsprayed check. There were no significant differences between the fungicide treatments.

TREATMENT	RATE g ai/100L	July 10		September 10	
		Terminal leaves	Fruit	Terminal leaves	Fruit
UNSPRAYED	.....	35.0 b	9.6 b	78.6 b	68.0 b
POLYRAM 80	169.0	0.0 a	0.0 a	0.5 a	0.3 a
TOPAS MZ61	79.3	0.0 a	0.0 a	0.0 a	0.1 a

CROP: Apple var. Empire

PEST: Apple scab, Venturia inaequalis (Cke) Wint.

TITLE: Control of apple scab with an application of DPX-H6573 on a 10 to 14 day schedule-1.

MATERIALS: DPX-H6573 20% DF
BENLATE 50% WP (benomyl)
MANZATE 200 80% WP (mancozeb)

METHODS: Applications during the primary infection period were made according to a 10 to 14 day schedule on the following dates. April 25; May 8, 18; June 4, 18. After June 18, the NUSTAR applications were stopped and MANZATE 200 at 4000 g ai/ha was utilized on a 7 day schedule. The standard treatment was sprayed on a 2 day schedule and consisted of a mixture of benomyl at 275 g ai/ha and mancozeb at 2600 g ai/ha for the primary infections. Starting July 2, through August 27, mancozeb at 4000 g ai/ha was used as a standard treatment. Applications were made with a hand gun at a volume of 784 L/ha and a pressure of 2250 kPa. Treatments consisted of single tree plots replicated three times. The evaluation on leaves was performed on July 5 after the last application with NUSTAR. One hundred leaves per tree were assessed for a total of 300 leaves per treatment. On both evaluation dates, 25 apples per tree were assessed for a total of 75 apples per treatment. Location: St-Gregoire, Quebec.

NAME AND AGENCY:
Poliquin, Bernard
Turcotte, Diane
Du Pont Canada Inc., Agricultural Products
P.O. Box 660, Station "A"
Montreal (Quebec) H3C 2V1

RESULTS: The results are summarized in the table below.

CONCLUSIONS: NUSTAR at 20 g ai/ha sprayed during the primary infection period was sufficient to provide scab control not significantly different than higher rates or the standard treatment on both leaves and fruits. Results obtained with the four treatments were significantly different than those obtained with the untreated check. This was also the case for fruit infection at harvest. However, no significant differences were noticed between the treatments and the untreated check when fruit russetting as assessed at harvest.

EVALUATION DATE	TREATMENT	RATE g ai/ha	SCHEDULE	% INFECTION LEAVES	% INFECTION FRUITS
July 5, 87	1. DPX-H6573	20	10 to 14 days	0.0 a *	1.3 a
	2. DPX-H6573	40	10 to 14 days	0.3 a	0.0 a
	3. DPX-H6573	60	10 to 14 days	0.0 a	0.0 a
	4. Standard	See Methods	7 days	0.3 a	0.0 a
	5. check	-	-	13.3 b	4.0 b
				LSD.05 = 5.017	LSD.05 = 1.945
				% FRUIT RUSSETTING	% FRUIT SCAB
September 11, 87	1. DPX-H6573	20	10 to 14 days	6.7 a	0.0 a
	2. DPX-H6573	40	10 to 14 days	9.7 a	0.0 a
	3. DPX-H6573	60	10 to 14 days	5.3 a	0.0 a
	4. Standard	See Methods	7 days	6.7 a	0.0 a
	5. Check	-	-	9.0 a	3.5 b
				LSD.05 = 11.799	LSD.05 = 2.947

*Treatment means in the same column followed by the same letter are not significantly different at the 5% level (LSD.05).

CROP: Apple var. McIntosh

PEST: Apple scab, Venturia inaequalis (Cke) Wint.

TITLE: Control of apple scab with an application of DPX-H6573 on A 10 to 14 days schedule-2.

MATERIALS: DPX-H6573 20% DF
BENLATE 50% WP (benomyl)
MANZATE 200 80% WP (mancozeb)

METHODS: Applications during the primary infection period were made according to a 10 to 14 day schedule on the following dates. April 25; May 6, 18; June 2, 18. After June 18, the NUSTAR applications were stopped and MANZATE 200 at 4000 g ai/ha was utilized on a 7 day schedule. The standard treatment was sprayed on a 7 day schedule and consisted of a mixture of benomyl at 275 g ai/ha and mancozeb at 2600 g ai/ha for the primary infections. Starting July 2nd through August 27th, mancozeb at 4000 g ai/ha was used as a standard treatment. Applications were made with a hand gun at a volume of 784 L/ha and a pressure of 2250 kPa. Treatments consisted of single tree plots replicated three times. The evaluation on leaves was performed on July 5 after the last application with NUSTAR. One hundred leaves per tree were assessed for a total of 300 leaves per treatment. On both evaluation dates, 25 apples per tree were assessed for a total of 75 apples per treatment. Location: Rougemont, Quebec.

NAME AND AGENCY:
Poliquin, Bernard
Turcotte, Diane
Du Pont Canada Inc., Agricultural Products
P.O. Box 660, Station "A"
Montreal (Quebec) H3C 2V1

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Nustar at 20 g ai/ha sprayed during the primary infection period was sufficient to provide adequate scab control and was not significantly different than higher rates of rates of Nustar or the standard treatment on both leaves and fruits. Results for treatments 1 to 4 were significantly different than those obtained in the untreated check. At harvest, no significant differences were noticed on apple scab between the four treatments, as perfect control (0.0% infection) was seen. Results in the untreated check were significantly higher (18.7% infection) when compared to the other treatments. No significant differences were seen between all treatments on fruit russetting.

EVALUATION DATE	TREATMENT	RATE g ai/ha	SCHEDULE	% INFECTION LEAVES	% INFECTION FRUITS
July 5, 87	1. DPX-H6573	20	10 to 14 days	1.3 a*	0.0 a
	2. DPX-H6573	40	10 to 14 days	0.0 a	0.0 a
	3. DPX-H6573	60	10 to 14 days	0.0 a	0.0 a
	4. Standard	See Methods	7 days	0.0 a	0.0 a
	5. Check	-	-	37.3 b	6.7 b
				LSD.05 = 7.581	LSD.05 = 1.945
				% FRUIT RUSSETTING	% FRUIT SCAB
September 10, 1987	1. DPX-H6573	20	10 to 14 days	22.7 a	0.0 a
	2. DPX-H6573	40	10 to 14 days	21.3 a	0.0 a
	3. DPX-H6573	60	10 to 14 days	30.3 a	0.0 a
	4. Standard	See Methods	7 days	34.7 a	0.0 a
	5. Check	-	-	37.3 a	18.7 a
				LSD.05 = 17.298	LSD.05 = 1.945

* Treatment means in the same column followed by the same letter are not significantly different at the 5% level (LSD.05)

CROP: Apple, cv. McIntosh

PEST: Apple Scab, Venturia inaequalis (cke.) Wint.

TITLE: EVALUATION OF FUNGICIDES FOR CONTROL OF APPLE SCAB, 1987

MATERIALS: ACR 3815 70W (3.3% pyrifenox + 66.7% mancozeb), EQUAL 65W (dodine) TOPAS MZ 61W (1.56% penconazole + 59.4% mancozeb)

METHODS: The experiment was conducted in Creston, B.C. in a five year old McIntosh orchard. Thirty-five trees divided into two equal rows were separated into 5 blocks of 7 random single tree replicates per block. The 7 treatments were applied until runoff with a backpack sprayer following an eradicant or protectant schedule. The eradicant applications were May 6, May 18, May 29, June 9, June 17, June 25 and July 9 and the protectant applications were May 6, May 20, June 3, June 17 and July 9. In addition to these applications, TOPAS MZ was applied once more on August 24 for residue analysis.

Foliage scab was evaluated on July 7 on 10 randomly selected shoots from each single tree replicate. Fruit harvested on September 14 was evaluated for scab by counting the number of fruit from each tree with scab lesions compared to the total number of fruit. Most of the trees had more than 20 fruit with an average of 34 fruit per tree. Fruit weight was the average weight of all the fruit from a particular tree. Fruit shape (length/diameter) was based on at least 10 fruit/tree and as many as 20 fruit/tree.

NAME AND AGENCY:
SHOLBERG, P.L. and WESOLOWSKI, M.
Agriculture Canada
Research Station
SUMMERLAND, British Columbia V0H 1Z0

RESULTS: Results are summarized below.

CONCLUSIONS: All the fungicides tested provided better scab control than the nonsprayed control. ACR-3815 used as an eradicant allowed the fewest lesions per leaf to develop. Both ACR-3815 and TOPAS MZ prevented fruit infections. We did not detect any significant differences in fruit weight or shape.

OBSERVATIONS: Scab pressure was high in this orchard because it was not controlled in 1986. We did not observe any symptoms of phytotoxicity in this study.

Treatment	Formulation	Timing	Rate a.i. per 100 L	% Leaves Infected	Lesions per Leaf	% Fruit Infected	Fruit[1] Weight (g)	Fruit[2] Shape
ACR-3815	70W	Eradicant	105 g	0.4 d*	0.01 c	0.00 c	156 a	0.821 a
ACR-3815	70W	Protectant	105 g	2.2 cd	0.03 c	0.00 c	160 a	0.817 a
TOPAS-MZ	61W	Eradicant	133 g	4.2 cd	0.10 cb	0.00 c	158 a	0.789 a
TOPAS-MZ	61W	Protectant	133 g	7.8 bc	0.14 cb	0.00 c	156 a	0.780 a
EQUAL	65W	Eradicant	48.8 g	11.8 b	0.51 b	5.03 bc	150 a	0.811 a
EQUAL	65W	Protectant	25 g	5.4 bc	0.24 cb	6.78 b	149 a	0.803 a
CONTROL	-	-	-	20.2 a	1.62 a	45.8 a	139 a	0.796 a

1 Grams per fruit.
2 Ratio of length to diameter
* Treatment means in the same column followed by the same letter are not significantly different at the 5% level (DMRT).

CROP: Apple cv. McIntosh

PESTS: Apple Scab, *Venturia inaequalis* (Cke.) Wint.,

TITLE: EVALUATION OF FUNGICIDE MIXES FOR CONTROL OF APPLE SCAB

MATERIALS: ACR-3815 70% WP (66.7% mancozeb + 3.3% pyrifenox), MANZATE 200 80% WP (mancozeb), NUSTAR 20 DF (flusilazole), PP523 5% SC (hexaconazole), RH-3866 60% DF (myclobutanil), TOPAS MZ 61W (59.4% mancozeb + 1.56% penconazole)

METHODS: Scab control was evaluated in a randomized complete block design, replicated three times, using three tree plots of 16 year old McIntosh apple trees on M9 or M26 rootstock. Unsprayed guard trees were left between the plots to reduce spray drift. The materials were sprayed to runoff using a hydraulic handgun attached to a Rittenhouse sprayer operating at 2700 kPa.

Fungicide sprays were applied on April 29 (pink), May 25 (post calyx), June 4, 15, 25 and July 6. During this time, 13 scab infection periods occurred on April 27-29, May 14-15, 22-23, 26-28, June 2,3, 7-8, 11-14, 22, 26-27, 29, July 2-3, 3-4. The fungicides were not applied after the May 14-15 wetting period because at that time the infection period was questionable.

On June 16, scab was assessed on all leaves and fruit on 20 clusters and all leaves on 10 terminals per plot. Scab was assessed on all leaves on 20 terminals per plot on August 19 and on 100 fruit per plot on September 2. Data were expressed as percent leaves or fruit with scab

NAME AND AGENCY:
WARNER, J. and COOK, J.M.
Agriculture Canada, Smithfield Experimental Farm, P.O. Box 340, Trenton, Ontario K8V 5R5

and analysed following arcsin transformation using analysis of variance and Duncan's multiple range test (P=0.05)

RESULTS: See table below

CONCLUSIONS: All treatments provided better scab control to both the leaves and fruit as compared to the unsprayed control plots by June 16. ACR-3815 and NUSTAR (5.9 g rate) provided the best control of scab on the cluster leaves. NUSTAR (5.9 g rate) also provided the best scab control on the fruit and terminal leaves up to June 16.

All treatments maintained better scab control on the terminal leaves and fruit as compared to the unsprayed control plots to the end of the season. NUSTAR (5.9 g rate) provided the best overall scab control. MANZATE alone was less effective in controlling scab than the sterol inhibiting fungicides or the mixtures used in this trial. The mixtures of NUSTAR + MANZATE and RH-3866 + MANZATE did not provide scab control signficantly better than NUSTAR alone or RH-3866 alone, respectively.

While fruit scab in the control and MANZATE plots increased from mid June to harvest, fruit scab decreased in other plots indicating the curative activity of the sterol inhibitng fungicides.

(Financial support from Dupont and Rohm and Haas in support of this work is appreciated.)

Treatment and Formulation	Rate Product per 100 L	PERCENT WITH SCAB				
		June 16			Aug. 19	Sept. 2
		Cluster Leaves	Terminal Leaves	Fruit	Terminal Leaves	Fruit
Control	-	92.8 a[1]	51.3 a	90.4 a	98.4 a	100.0 a
MANZATE 200 80% WP	100 g	68.1 b	28.6 b	31.6 b	60.8 b	45.3 b
ACR-3815 70% WP	119 g	7.9 e	4.3 cd	2.3 cd	8.8 ef	1.0 cd
PP523 5% SC + MANZATE 200 80% WP	11.9 ml (17.8 ml)[2] 100 g	15.2 de	6.0 cd	18.7 bc	15.4 de	6.7 c
TOPAS MZ 61% W	133 g	61.9 bc	13.0 c	9.0 bcd	31.7 c	2.7 cd
RH-3866 60% DF	5 g	26.2 d	6.1 cd	18.3 bcd	11.0 ef	5.0 cd
RH-3866 60% DF + MANZATE 200 80% WP	5 g 100 g	48.0 c	4.9 cd	16.9 bc	7.8 ef	2.0 cd
NUSTAR 20 DF	5.9 g	8.7 e	0.8 d	0.0 d	6.4 f	0.0 d
NUSTAR 20 DF	3.0 g	16.8 de	4.9 cd	4.7 cd	19.5 d	2.3 cd
NUSTAR 20 DF + MANZATE 200 80% WP	3.0 g 100 g	45.7 c	11.8 c	2.6 cd	14.0 de	2.0 cd

[1]Means followed by the same letter within each column not signficantly different using Duncan's multiple range test (P=0.05). The data were analysed following arcsin transformation.
[2]Rate in brackets was used in the prebloom application (April 29) and was not mixed with MANZATE.

CROP: Apple, M26 rootstock, Spur McIntosh scion cultivar

PEST: Apple replant disease, Biotic and abiotic causal agents

TITLE: EVALUATION OF SOIL FUMIGANT AND PHOSPHATE FERTILIZER FOR CONTROL OF APPLE REPLANT DISEASE

MATERIALS: FORMALIN (37%), Ammonium phosphate (11-55-0)

METHODS: Old apple trees with their roots were removed from two sites in the fall of 1985 and the field ground was cultivated twice. Ammonium phosphate was thoroughly mixed in each planting hole (approximately 100 L of soil) on May 5, 1986 at Summerland and on May 9, 1986 at Kelowna. FORMALIN was drenched at each planting site with 6 L of water on May 8, 1986 at Summerland and on May 13, 1986 at Kelowna. Plots at both locations were replicated 3 times, 10 trees per plot, in a randomized complete block design. Trees were planted on June 2, 1986 at the Summerland site and on June 5, 1986 at the Kelowna site. Tree spacing was 4.5 m between rows and 1 m between trees. Trees were budded with spur McIntosh scion cultivar in the last week of August 1986. Total current season shoot growth of rootstock/scion is measured in the last week of September in 1986 and 1987 at both locations.

LOCATION: Summerland and Kelowna, British Columbia

NAME AND AGENCY:
UTKHEDE, R.S. and E. SMITH
Agriculture Canada
Research Station
Summerland, British Columbia V0H 1Z0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: In 1986, fumigation of soil with FORMALIN significantly increased the shoot growth at the Kelowna site but not in Summerland. The effect of ammonium phosphate application on shoot growth was more pronounced at the Summerland site than in Kelowna. In 1987, the ammonium phosphate application significantly increased shoot growth at the Summerland site but not in Kelowna. Fumigation of soil with FORMALIN was ineffective at both locations in the second year of the test.

Treatment	Rate ai/site	Shoot growth (cm)			
		Summerland		Kelowna	
		1986	1987	1986	1987
No treatment	-	45.0 b*	50.3 b	38.9 c	94.5 a
Ammonium phosphate (11-55-0)	100 g	68.8 a	88.1 a	50.0 b	119.1 a
FORMALIN	74 g	44.7 b	64.9 b	55.6 ab	110.2 a
Ammonium Phosphate + FORMALIN	100 g + 75 g	69.1 a	69.4 b	57.7 a	131.6 a

* Treatment means in the same column followed by the same letter are not significantly (P = 0.05) different using Duncan's New Multiple Range Test.

CROP: Apple var. McIntosh

PEST: Apple powdery mildew Podosphaera leucotricha

TITLE: Evaluation of DPX-H6573 versus standard treatment for control of fungal organisms on apples.

MATERIALS: DPX-H6573 20% DF (NUSTAR)
benomyl 50% WP (BENLATE)
mancozeb 80% WP (MANZATE 200)

METHOD: Treatments were applied to single tree plots with a hand held gun at a pressure of 2587.5 kPa. Plots were replicated four times in a randomized block design. DPX-H6573 was applied at 20, 40 and 60 g ai/ha; BENLATE at 275 and 550 g ai/ha and MANZATE 200 at 2600 and 4000 g ai/ha. The applications were at half inch green, early pink, petal fall and fruit set. Trees were evaluated on May 13 1987 for primary mildew infection by counting the number of infected terminals/tree. Secondary mildew infection was evaluated June 17, 1987 by rating 10 leaves on 10 randomly selected terminals on a scale of 0 to 10 (0 = No infection present, 10 = 100% infection).
Location: Kelowna, B.C.

NAME AND AGENCY
DUMAINE, L.C., J.G. HATFIELD
Du Pont Canada Agricultural Products
Box 2300 Streetsville, Mississauga
Ontario L5M 2J4

RESULTS: The results are summarized in the table below.

CONCLUSIONS: On the first evaluation date, the 20 g ai/ha and 60 g ai/ha treatments of NUSTAR significantly reduced the incidence of infected terminals versus the untreated. However, there was no significant difference between any of the chemical treatments. The final evaluation resulted in all NUSTAR treatments significantly reducing the incidence of infection when compared to other chemical treatments and the check.

TREATMENT	RATE g ai/ha	PRIMARY POWDERY MILDEW MAY 13 1987 # INFECTED TERMINALS/TREE	SECONDARY POWDERY MILDEW AVERAGE RATING OF 100 LEAVES:JUNE 17 1987 0 = NO INFECTION 10 = 100% INFECTION
DPX-H6573	20	6.0 a**	1.10 a
DPX-H6573	40	13.8 ab	1.43 a
DPX-H6573	60	10.8 a	1.15 a
MANZATE/BENLATE	See *	19.0 ab	2.30 b
BENLATE	550	17.3 ab	1.95 b
Untreated	-	27.5 b	2.10 b
LSD		(15.0)	(0.46)

* 1st application was MANZATE 2600 g ai/ha plus BENLATE 275 g ai/ha. The three following applications were MANZATE 4000 g ai/ha.

Application dates: 1. 09-04-87
2. 22-04-87
3. 06-05-87

CROP: Apple var. Red Rome

PEST: Apple Powdery mildew, Podosphaera leucotricha

TITLE: Evaluation of DPX-H6573 versus standard treatment for control of powdery mildew.

MATERIALS: DPX-H6573 20% DF (NUSTAR)
benomyl 50% WP (BENLATE)

METHODS: Treatments were applied to 10 2 year old trees with a back-pack sprayer at a pressure of 276 kPa. Plots were replicated four times in a completely randomized design. DPX-H6573 was applied at 20, 40 and 60 g ai/ha; BENLATE at 550 g ai/ha. The application dates were May 22 and June 6 1987. Trees were evaluated for powdery mildew infection June 10 1987 by counting the number of infected terminals compared to the total number of terminals/tree.
Location: Naramata, B.C.

NAME AND AGENCY:
DUMAINE, L.C., J.G. HATFIELD
Du Pont Canada Agricultural Products
Box 2300 Streetsville, Mississauga
Ontario L5M 2J4

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Evaluation on June 10 demonstrated no significant difference between the chemical treatments. NUSTAR treatments of 40 g ai/ha and 60 g ai/ha resulted in significantly less infection than the untreated trees.

TREATMENTS	RATE g ai/ha	EVALUATION DATE	POWDERY MILDEW EVALUATION AVERAGE RATIO : INFECTED TERMINALS / TOTAL TERMINALS
DPX-H6573	20	June 10 1987	7.6 ab*
DPX-H6573	40	June 10 1987	1.0 a
DPX-H6573	60	June 10 1987	3.2 a
BENLATE	550	June 10 1987	8.3 ab
Untreated check	-	June 10 1987	12.9 b
LSD			(8.92)

* Treatment means in the same column followed by the same letter are not significantly different at the 5% level (LSD.05)

CROP: Apple var. McIntosh

PEST: Apple powdery mildew, Podosphaera leucatricha

TITLE: Evaluation of DPX-H6573 versus standard treatment for control of fungal organisms on apples.

MATERIALS: DPX-H6573 20% DF (NUSTAR), benomyl 50 WP (BENLATE) mancozeb 80 WP (MANZATE 200)

METHOD: Treatments were applied to single tree plots with a hand held gun at a pressure of 2587.5 kPa. Plots were replicated four times in a randomized block design. DPX-H6573 was applied at 20, 40 and 60 g ai/ha; BENLATE at 275 and 550 g ai/ha and MANZATE 200 at 2600 and 4000 g ai/ha. The applications were at half inch green, early pink, petal fall and fruit set. Trees were evaluated May 11, 1987 for primary mildew infection by counting the number of infected terminal/tree. Secondary mildew infection was evaluated June 12, 1987 by rating 10 leaves on 10 randomly selected terminals on a scale of 0 to 10 (0=No infection present, 10=100% infection.) Location: Kelowna, B.C.

NAME AND AGENCY
DUMAINE L.C., J.G. HATFIELD
Du Pont Canada Agricultural Products
BOX 2300 Streetsville, Mississauga
Ontario L5M 2J4

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Evaluation on May 11 demonstrated no significant difference between the untreated and the chemical treatments. Evaluation of leaf infection on June 12 resulted in all chemical treatments having significantly less infection than the untreated trees, yet there was no different between chemical treatments.

TREATMENT	RATE g ai/ha	PRIMARY POWDERY MILDEW MAY 11, 1987 # INFECTED TERMINALS/TREE	SECONDARY POWERY MILDEW AVE. OF 100 LEAVES:JUNE 12 1987 0 = NO INFECTION 10 = 100% INFECTION
DPX-H6573	20	3.0 a**	0.70 a
DPX-H573	40	5.3 a b	0.81 a
DPX-H6573	60	4.3 a b	0.71 a
MANZATE/BENLATE	(See *)	9.0 b	1.01 a
BENLATE	550	3.0 a	0.79 a
Untreated	-	6.0 ab	1.54 b
LSD		(4.8)	(0.37)

* 1st application was MANZATE 2600 g ai/ha plus BENLATE 275 g ai/ha. The three following applications were MANZATE 4000 g ai/ha.

** Treatment means in the same column followed by the same letter are not significantly different at the 5% level (LD.05).

Application dates: 1. - 09-04-87
2. - 23-04-87
3. - 06-05-87
4. - 21-05-87

CROP: Apple, cv. Jonathan

PEST: Powdery mildew, Podosphaera leucotricha (E. & E.) Salmon

TITLE: EVALUATION OF FUNGICIDES FOR POWDERY MILDEW CONTROL

MATERIAL: NUSTAR 20DF

METHODS: Six trees, 14-years-old growing in a single row at the Summerland Research Station were used for this test. The 3 trees which were sprayed were separated by control trees. The material was applied with a handgun operating at 900 kPa and sprayed until runoff on a 14 day schedule on the following dates: April 9 (tight-cluster), April 21 (pink), May 8 (petal fall), May 22 (first cover) and June 5 (second cover).

Secondary powdery mildew was evaluated on June 15 by randomly selecting 10 shoots on each single tree replicate and counting the number and degree of mildew on each leaf. The apples were harvested on September 24 at which time 100 apples from each tree were randomly selected. Each apple was evaluated for fruit russet due to mildew and its shape (length/diameter) measured.

NAME AND AGENCY:
SHOLBERG, P.L. and PALMER, R.
Agriculture Canada
Research Station
SUMMERLAND, British Columbia V0H 1Z0

RESULTS: We did not observe any fruit russetting due to powdery mildew. Results of foliage mildew, fruit weight and shape are summarized below.

CONCLUSIONS: NUSTAR provided effective control of powdery mildew on this extremely susceptible variety, and did not have an adverse effect on fruit shape or weight in this experiment.

OBSERVATIONS: Fruit russetted by unknown causes appears to be smaller than non-russetted fruit.

Treatment	Formulation	Rate a.i. per 100 L	% Secondary Mildew		Av. Weight per fruit	Shape[1]
			Leaves	Leaf area		
NUSTAR	20 DF	3.2 g	27.4*	6.2*	142.5 g	0.831
Control	-	-	68.3	22.5	141.1 g	0.838

1 Shape = Ratio of length to diameter.

* Values in these columns are significantly different at P = 0.05 according to the analysis of variance and F test.

CROP: Apple, cv. McIntosh

PEST: Powdery Mildew, Podosphaera leucotricha (Ell. & Ev.) Salm.

TITLE: COMPARISON OF FUNGICIDES FOR CONTROL OF APPLE POWDERY MILDEW

MATERIALS: EASOUT 70W (thiophanate-methyl); EASOUT 70W plus MANZATE 200 80W (thiophanate-methyl plus mancozeb)

METHODS: Four McIntosh orchards in the Kelowna area were selected with uniform trees ranging in age from 10-25 years. Three treatment blocks were established in each orchard. The control consisted of the normal spray program carried out by the grower. In all cases, one spray of EASOUT at 2.25 kg/ha was applied once. Additional fungicide sprays included wettable sulphur (11.5 kg/ha) and dodine (EQUAL 65) at 3.25 kg/ha. The second treatment was EASOUT 70W alone at 2.25 kg/ha applied at pink (April 21), bloom (May 2), postbloom (May 20) and first cover (June 2). The spray dates varied somewhat between orchards. The third treatment consisting of a combination of EASOUT 70W at 1.1 kg/ha and mancozeb at 3.25 kg/ha was applied on the dates listed above in each orchard. All sprays were applied by the grower using an air blast sprayer. A detailed evaluation of mildew was made in June rating 10 leaves on each of 20 shoots on five trees randomly selected throughout the treatment block. The August evaluation consisted of a mildew rating of 20 shoots on each of five trees randomly selected within each treatment block.

NAME AND AGENCY:
YORSTON, J.M.
B.C. Ministry of Agriculture and Fisheries
1873 Spall Road
KELOWNA, British Columbia V1Y 4R2

and

DEKRUYFF, J.
CIBA-GEIGY
KELOWNA, British Columbia

RESULTS: The results are summarized in the table below.

CONCLUSIONS: In three of the four test sites there was no significant difference in mildew levels between the EASOUT alone and the EASOUT plus mancozeb treatment. Results between the two rating times cannot be compared because different rating systems were used. The first rating was a much more detailed evaluation of individual leaves with the second rating of the shoot as a whole. Mildew levels were quite low at the time of the first rating but had increased considerably by August. A trace of apple scab was found during the August evaluation however the numbers were too low to make comparisons between treatments. It can be concluded however, that the EASOUT and EASOUT plus mancozeb treatments gave control of apple scab because several infection periods occurred during the growing season and abundant scab was found in nearby orchards where control measures were inadequate.

Treatment	Rate (kg a.i./ha)	Orchard A		Orchard B		Orchard C		Orchard D	
		June 1[1]	Aug. 6[2]	June 19	Aug. 6	June 1	Aug. 6	June 2	Aug. 6
Check	-	5.7 a*	2.8 a	1.2 b	2.5 ab	7.9 a	3.5 a	5.5 a	2.3 a
EASOUT 70W	1.58	2.8 b	2.2 a	1.0 b	2.2 b	3.3 b	2.3 b	1.5 b	2.6 a
EASOUT 70W + MANZATE 200 80W	0.77 + 2.60	2.5 b	1.8 a	2.2 a	2.9 a	4.0 b	2.6 b	2.7 b	2.3 a

[1] Mildew rating is an arbitrary scale, 0 - no infection to 10 severe infection. The number is a mean of the leaf rating totals for 10 leaves on 100 shoots.

[2] Mildew rating is an arbitrary scale with 0 - no infection to 10 - severe infection. The number is a mean rating for 100 shoots.

* Means in each column followed by the same letter(s) are not significantly different at P = 0.05 (Multiple Range Test).

CROP: Apple cv. Golden Delicious

PEST: Superficial mold, Alternaria spp., Cladosporium spp.

TITLE: EVALUATION OF FUNGICIDES FOR CONTROL OF SUPERFICIAL MOLD

MATERIALS: BENLATE 50 WP (Benomyl), DOWICIDE A (Sodium orthophenylphenate), MERTECT 45% w/v (Thiabendazole)

METHODS: Apples packed into boxes in November, 1985 and placed in controlled atmosphere storage until April, 1986 were brought to our laboratory. The fruit was separated into lots of 150 for each treatment and dipped for 5 min. into 6 liters of the appropriate fungicide or water. Once dry each treatment was separated into 5 replicates of 30 fruit per replicate, 5 fruit from each replicate with those from other treatments were placed on cardboard packing trays according to a latin square design. The trays were placed inside a cardboard box which held 5 trays of fruit. Thus each box of fruit held one replicate for each five treatments and there were five boxes for each treatment. The boxes of apples were then placed into a 1-2°C cold room. Relative humidity appeared to be too low initially for disease development so a humidifier was placed in the apple storage room on Aug. 7, 1986 which produced a relative humidity of 95%. An improved humidifier was placed in the storage area on Aug. 22, 1986 which provided 98-100% relative humidity. Each apple was evaluated for superficial and other mold problems on Oct. 21, 1986.

NAME AND AGENCY:
SHOLBERG, P.L. and OWEN, G.
Agriculture Canada
Research Station
SUMMERLAND, British Columbia V0H 1Z0

RESULTS: Results are summarized in the two tables below.

CONCLUSIONS: Dowicide A at 5000 mg/L provided effective control, however if the fruit was rinsed after treatment control was ineffective. Rinsing is essential to prevent phytotoxic browning of the fruit therefore this is not a practical control.

It was noted during these tests that fruit treated with 40 or 50°C water had a significantly higher percentage of Penicillium rot than the control or Dowicide A treated fruit. Fruit decay due to a "low temperature basidiomycete" also occurred on these apples. The percent of the apples in each treatment with this disease ranged from 9% in the 50°C hot water treatment to 32% in the 5000 mg/L Dowicide A treatment. The differences between the treatments were not significant, however.

Table 1. Effect of water temperature and/or DOWICIDE A in controlling calyx end superficial mold growth

Treatment	Temperature (°C)	Rate a.i. (mg/L)	Superficial Mold (Percent)
DOWICIDE A	30	2500	38 a
DOWICIDE A	20	2500	41 a
Water	50	--	46 a
Water	40	--	52 ab
Water	20	--	66 b

Values within a column followed by the same letter are not significantly different at the 5% level as determined by Duncan's multiple range test

Table 2. Effect of various fungicides in controlling calyx end superficial mold growth

Treatment	Rate a.i. (mg/L)	Superficial Mold (Percent)
DOWICIDE A	5000	28 a
DOWICIDE A and water rinse	5000	41 ab
BENLATE 50 WP	300	54 ab
MERTECT 45% FL	980	56 c
Control	--	56 c

Values within a column followed by the same letter are not significantly different at the 5% level as determined by Duncan's multiple range test

CROP: Apricot cv. Blenheim

PEST: Brown rot, Monilinia fructicola (Wint) Honey

TITLE: EVALUATION OF FUNGICIDES FOR APRICOT BROWN ROT CONTROL

NAME AND AGENCY:
SHOLBERG, P.L.
Agriculture Canada
Research Station
SUMMERLAND, British Columbia V0H 1Z0

MATERIALS: BENLATE 50W (benomyl), Captan 50W, ROVRAL 50W (iprodione)

METHODS: Nine trees, approximately 21 years old were divided into three blocks of three trees per block. The experimental design used was the randomized block which provided three replications for each treatment. Materials were sprayed until runoff with a handgun operating at 900 kPa. The materials were applied on June 30 (green fruit), July 14 (ripening fruit) and July 28 (mature fruit) one day before harvest.

Brown rot was evaluated by counting the total number of brown rotted fruit in each tree two days before harvest (July 27) and again after harvest by taking 60 ripe fruit from each tree, storing at 20°C under high relative humidity (90-100%) for 6 days (Aug. 4) and counting the number of brown rotted fruit.

RESULTS: Results are summarized below.

CONCLUSIONS: ROVRAL and BENLATE-Captan provided effective control on trees exposed to high numbers of brown rot spores as indicated by the large number of infected fruit in the control trees. Harvested fruit were protected from the disease by both ROVRAL and BENLATE-Captan when stored for 6 days under conditions very conducive to brown rot.

Treatment	Formulation	Rate a.i. per 100 L	Brown Rotted Fruit	
			Number/Tree	% Harvested
BENLATE + Captan	50W	10.0 g + 45.0 g	11.7 a*	25.0 a
ROVRAL	50W	25.0 g	26.7 ab**	22.8 a
Control	-	-	60.6 b	83.3 b

* Mean values followed by the same letter are not significantly different at the 5% level according to Duncan's new multiple range test.

** One replicate in this treatment was considerably more mature than the others and was abandoned.

CROP: Cherry cv. Sam

PEST: Green mold, Alternaria sp. Brown rot, Monilinia sp.

TITLE: EVALUATION OF FUNGICIDES FOR POSTHARVEST DECAY CONTROL

MATERIALS: ROVRAL 50W (Iprodione)

METHODS: The trial was conducted at the Summerland Research Station on a row of 6 mature cherry trees. Three treated trees alternated with three control trees were sprayed to runoff at 900 kPa on June 11 (21 days before harvest), June 23 (7 days before harvest) and June 30 (1 day before harvest). Insufficient fruit was produced so the fruit was bulked together in order to have enough treated and control fruit for further testing. Four lots of 300 fruit each were obtained with those requiring a ROVRAL dip being placed in a water suspension of the fungicide for 1 min.

The cherries were incubated at room temperature (20-25°C) on a laboratory bench and covered with wet cheesecloth and polyethylene to keep the relative humidity near 100%. Each cherry was examined for decay after 7 days.

NAME AND AGENCY:
SHOLBERG, P.L.
Agriculture Canada
Research Station
SUMMERLAND, British Columbia V0H 1Z0

RESULTS: Results are summarized in the table below.

CONCLUSIONS: ROVRAL 50W controlled postharvest rots of cherries caused by Alternaria sp. and Monilinia sp. by spraying in the field and by postharvest dipping.

Treatment	Rate a.i. mg/L	% Rot		
		Brown rot	Green mold	Other
Control	-	3	63	4
Control + ROVRAL 50W Dip	500	0	19	0
Field Sprayed with ROVRAL 50W	250	0	3	67*
Field Sprayed with ROVRAL 50W Dip	250 + 500	0	4	1

* Penicillium sp. (many of these infections were due to secondary spread of the inoculum on the laboratory bench).

CROP: Peaches cv. Early Redhaven

PEST: Brown rot, Monilinia fructicola (Wint.) Honey

TITLE: EVALUATION OF FUNGICIDES FOR POST-HARVEST BROWN ROT CONTROL

MATERIALS: ACR 3675 200EC (pyrifenox), ACR 3815 70W (3.3% pyrifenox + 66.7% mancozeb), BAY HWG 1608 22.5DF, BENLATE 50W (benomyl), BOTRAN 75W (dicloran), NUSTAR 20DF, PP 523 50SC (hexaconazole), TOPAS 100EC (penconazole), TOPAS MZ 61W (1.56% penconazole + 59.4% mancozeb).

METHODS: Peaches grown without the use of fungicides at the Summerland Research Station were harvested on August 6. The ripe fruit was surface-sterilized by immersing for 2 min in a 0.6% solution of sodium hypochlorite, rinsed with two washes of distilled water and allowed to dry overnight. The next morning the fruit was divided into 9 lots of 40 fruit per lot and treated by dipping for 1 min into 10 liters of the appropriate fungicide. The fruit was allowed to dry for 2.5 hours. Ten fruit per treatment replicated 4 times were placed on cardboard peach trays. Each peach was injured on the stylar end with a 200 uL pipet tip where upon a 15 uL drop of spore suspension (5.0×10^5 conidia/mL) was placed. The cardboard peach trays were randomly placed on shelves in a room operated at 20°C and 80% relative humidity. The fruit was covered with polyethylene liners to further increase the relative humidity near the fruit.

After incubation for 3 days the peaches were evaluated for brown rot by counting each fruit that had visible decay at the point where the fruit was originally inoculated.

NAME AND AGENCY:
SHOLBERG, P.L.
Agriculture Canada
Research Station
SUMMERLAND, British Columbia V0H 1Z0

RESULTS: Results are summarized in the table below.

CONCLUSIONS: All the fungicides tested were extremely effective in preventing brown rot of harvested peaches. BENLATE was not as effective as the sterol-inhibiting fungicides used in these tests at these concentrations.

OBSERVATIONS: It was observed that after 5 days of incubation, brown rot developed on the TOPAS MZ treated peaches. Only the NUSTAR-BOTRAN mixture prevented the development of Rhizopus rot. We did not observe any signs of phytotoxicity such as discoloration in these tests.

Treatment	Formulation	Rate a.i. mg/L (ppm)	% Brown Rotted
ACR 3675	200EC	75	0.0 a*
ACR 3815	70W	1050 (50 + 1000)	0.0 a
BAY HWG 1608	22.5DF	75	0.0 a
BENLATE	50W	300	15.0 b
NUSTAR	20DF	75	0.0 a
NUSTAR + BOTRAN	20DF + 75W	75 + 1312	0.0 a
PP 523	50SC	75	0.0 a
TOPAS	100EC	75	0.0 a
TOPAS MZ	61W	915 (24 + 891)	0.0 a
Control	-	-	100.0 c

* Values within a column followed by the same letter are not significantly different at the 5% level as determined by Duncan's multiple range test.

CROP: Saskatoons (Amelanchier alnifolia)

PESTS: Brown Rot (Monilinia amelanchieris)
Sawflies (Hoplocampa spp.)

TITLE: EFFECT OF FUNGICIDES ON SAWFLIES AND BROWN ROT OF SASKATOONS IN 1986

MATERIALS: BENLATE (benomyl) 50 WP, EASOUT (thiophanate-methyl) 70 WP, FUNGINEX (triforine) 190 EC, ROVRAL (iprodione) 50 WP, TRITON B-1956.

METHODS: Fungicides were applied with Green Cross Superspray GX50 hand sprayers to plots 10 m long X 2 m wide X 2 m high in 2.0 L distilled water + 0.25 ml spreader-sticker to a 12-year old orchard near Grande Prairie, Alberta. A completely randomized block design with 4 replicates was used, occupying 13 of 30 rows. Spray schedules used are shown in the table. Berry clusters, 18/plot, were collected at 1 and 3 weeks after 90% petal fall, and at harvest. The number of berries present, missing, with brown rot, with sawfly, and other insect damage were counted, and analysed.

NAME AND AGENCY:

DAVIDSON, J.G.N. and NEIGHBOUR, S.A.
Agriculture Canada Research Station
BEAVERLODGE, Alberta T0H 0C0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Disease pressure was low with the result that none of the fungicides significantly reduced brown rot of saskatoon berries or the no. of berries missing, i.e. dropped.

However, some BENLATE and EASOUT treatments did significantly reduce sawfly damage to berries. This has been found before with BENLATE (1984, p. 250), but not with EASOUT. For each fungicide the earliest applications were the most effective in reducing sawfly damage, as was the case above also. This suggests that these fungicides may act as repellants if present prior to arrival of egg-laying sawflies. However, comparisons between fungicides and between the two years suggest a more complex situation, e.g. some schedules of ROVRAL and FUNGINEX also reduced sawflies in the first report but did not do so significantly this time.

There were no significant reductions of other types of insect damage.

TREATMENT	SPRAY DATES	RATE PER APPLICATION g ai/m^2	BERRIES MISSING %	BROWN ROT No. Berries	SAWFLY DAMAGE No. Berries	OTHER INSECT DAMAGE No. Berries
Check (d.w. + B-1956)	I II III IV V VI	(0.025)	23.1 ab*	3.0 abc	4.2 a	5.5 ab
BENLATE (i)	I - III IV - -	0.09	24.5 ab	2.1 bc	2.0 b	5.8 ab
BENLATE (ii)	- II - - V -	0.045	24.2 ab	3.0 abc	2.2 b	7.1 a
BENLATE (iii)	- - III - - VI	0.09	23.8 ab	2.5 bc	3.1 ab	6.4 a
ROVRAL (i)	I - III IV - -	0.09	22.1 ab	4.8 a	3.6 ab	5.7 ab
ROVRAL (ii)	- - III - - VI	0.045	21.1 ab	4.2 a	5.4 a	6.6 a
FUNGINEX (i)	I II III IV - -	0.05	25.9 a	3.2 ab	2.8 ab	5.8 ab
FUNGINEX (ii)	I II - - - VI	0.05	20.6 b	4.3 a	4.2 a	4.6 ab
EASOUT (i)	I - III IV - -	0.09	22.3 ab	3.2 abc	1.4 b	4.5 ab
EASOUT (ii)	- II - - V -	0.045	20.8 b	3.6 ab	3.8 ab	5.6 ab

Dates: I = leaf budbreak; II = flower budbreak; III = 90% petal fall; IV = 10 days after 90% petal fall; V = 30 days after 90% petal fall; VI = 60 days after 90% petal fall.

* Values followed by the same letter are not significantly different, P = 0.05 (Duncan's Multiple Range Test)

CROP: Saskatoon, cv. Smoky

PESTS: Brown rot, Monilinia amelanchieris; Rust, Gymnosporangium spp.

TITLE: EFFICACY AND PHYTOTOXICITY OF FUNGICIDES ON SASKATOONS

NAME AND AGENCY:
HOWARD, R.J. and MOSKALUK, E.R.
Alberta Special Crops and Horticultural Research Center, Brooks, AB, TOJ OJO
DAVIDSON, J.G.N.
Agriculture Canada Research Station
Beaverlodge, AB, TOH OCO

MATERIALS: BENLATE 50% WP (benomyl), EASOUT 70% WP (thiophanate-methyl), FUNGINEX 19 EC (triforine 190 g/L), TRITON B-1956 (modified phthalic glycerol alkyd resin, 77% SN)

METHODS: This trial was conducted in a saskatoon orchard at the ASCHRC, Brooks. The experimental design used was a randomized complete block with four replicates. Suitable bushes (average size 2.25m^2) were selected and color coded as to treatment. The required amount of chemical for each treatment was applied in two litres of water to two bushes in each of four replicates. The water control was applied to four bushes in each of four replicates. A CO_2-propelled, hand-held boom sprayer equipped with three TEE JET SS8002 fan nozzles spaced 45 cm apart and operated at 200 kPa was used in the vertical position to apply the treatments. All treatments, including controls, contained the spreader-sticker Triton B-1956 at 0.45 mL/2L. All spray treatments were applied at the following growth stages: a) flower buds with inflorescence extended but prior to white or pink bud, b) at 90% petal fall, and c) ten days after 90% petal fall.

Thirty-six berry clusters (18/bush) per treatment per replicate were collected just prior to harvest and examined for number of berries present, berries missing (pedicel scars), and evidence of disease. All bushes were visually examined for disease symptoms on the foliage and fruit. At harvest, two samples of ca. 300 grams of berries were collected from each pair of bushes per treatment per replicate and frozen for future residue analysis. Data were subjected to ANOVA.

RESULTS: The results are summarized in the table below. No apparent phytotoxic effects were visible on any of the treated bushes. Environmental conditions were not favorable for brown rot development and none was found on the berries in any of the treatments. None of the fungicides significantly increased the average numbers of berries per cluster or significantly reduced the percentage of missing berries relative to the check. As well, no significant control of rust was provided by any of the products tested.

CONCLUSIONS: A critical evaluation of the products under test was not possible because environmental conditions were not favorable for disease development.

Table 1. Yields and disease ratings on saskatoons treated with three fungicides.[1]

Treatment	Rate/application (g a.i./m^2)	Berries at harvest (avg. no./cluster)	Berries missing (%)	Berries with brown rot (%)	Bushes with[2] rust (%)
BENLATE 50%	0.09	6.5	37	0	50
EASOUT 70% WP	0.09	7.8	34	0	50
FUNGINEX 19 EC	0.05	7.3	38	0	25
Water check	-	7.3	30	0	38
ANOVA (P<0.05)		NS	NS	NS	NS

[1] All figures in this table are the same of four replications.

[2] Percentage data were arcsin transformed prior to analysis. Numbers reported are raw (untransformed) means.

CROP: Saskatoon, cv. Smoky

PESTS: Brown rot, Monilinia amelanchieris; Rust, Gymnosporangium spp.

TITLE: EFFICACY AND PHYTOTOXICITY OF FUNGICIDES ON SASKATOONS

NAME AND AGENCY:
HOWARD, R.J. and MOSKALUK, E.R.
Alberta Special Crops and Horticultural Research Center
Brooks, Alberta, TOJ 0J0

DAVIDSON, J.G.N.
Agriculture Canada Research Station
Beaverlodge, Alberta, T0H 0C0

MATERIALS: BENLATE 50% WP (benomyl), EASOUT 70% WP (thiophanate-methyl), FUNGINEX 19EC (triforine 190 g/L), TRITON B-1956 (modified phthalic glycerol alkyd resin, 77% SN).

METHODS: This trial was conducted in a saskatoon orchard at the ASCHRC, Brooks. The experimental design used was a randomized complete block with four replicates. Suitable bushes (average size 2.25m^2) were selected and color coded as to treatment. The required amount of chemical for each treatment was applied in two litres of water to two bushes in each of four replicates. The water control was applied to four bushes in each of four replicates. A CO_2-propelled, hand-held boom sprayer equipped with three TEE JET SS8002 fan nozzles spaced 45 cm apart and operated at 200 kPa was used in the vertical position to apply the treatments. All treatments, including controls, contained the spreader-sticker Triton B-1956 at 0.45 mL/2L. All spray treatments were applied at the following growth stages: a) flower buds with inflorescences extended but prior to white or pink bud, b) at 90% petal fall, and c) ten days after 90% petal fall.

Thirty-six berry clusters (18/bush) per treatment per replicate were collected just prior to harvest and examined for number of berries present, berries missing (pedicel scars), and evidence of disease. All bushes were visually examined for disease symptoms on the foliage and fruit. At harvest, two samples of ca. 300 grams of berries were collected from each pair of bushes per treatment per replicate and frozen for future residue analysis. Data were subjected to ANOVA.

RESULTS: The results are summarized in the table below. No apparent phytotoxic effects were visible on any of the treated bushes. Environmental conditions were not favorable for brown rot development and none was found on the berries in any of the treatments. None of the fungicides significantly increased the average numbers of berries per cluster or significantly reduced the percentage of missing berries relative to the check. As well, no significant control of rust was provided by any of the products tested.

CONCLUSIONS: A critical evaluation of the products under test was not possible because environmental conditions were not favorable for disease development.

Table 1. Yields and disease ratings on saskatoons treated with three fungicides.[1]

Treatment	Rate/application (g a.i./m^2)	Berries at harvest (avg. no./cluster)	Berries missing (%)	Berries with brown rot (%)	Bushes with[2] rust (%)
BENLATE 50%	0.09	6.5	37	0	50
EASOUT 70% WP	0.09	7.8	34	0	50
FUNGINEX 19 EC	0.05	7.3	38	0	25
Water check	-	7.3	30	0	38
ANOVA (P<0.05)		NS	NS	NS	NS

1 All figures in this table are the mean of four replications.

2 Percentage data were arcsin transformed prior to analysis. Numbers reported are raw (untransformed) means.

Diseases of Vegetable and Special Crops

Maladies des légumes et cultures spéciales

Edited by / Révisé par
C.L. Lockhart

CROP: Canola (Brassica napus L.) cv. Westar

PEST: Blackleg, Leptosphaeria maculans

TITLE: EFFICACY OF SEED DRESSING FUNGICIDES FOR CONTROL OF BLACKLEG OF CANOLA, 1987.

NAME AND AGENCY:
VERMA, P.R. and McKENZIE, D.L.
Agriculture Canada, Research Station
107 Science Crescent
Saskatoon, Saskatchewan
S7N 0X2

MATERIALS: UBI 2369-1 (carbathiin 4.5% + thiram 9% + lindane 67.5%), UBI 2451 (carbathiin 4.8% + TBZ 0.7% + metalaxyl 1.7% + lindane 71.4%), UBI 2417-1 (carbathiin 4.9% + metalaxyl 1.7% + lindane 73.2%), UBI 2402-1 (carbathiin 5% + thiabendazole 0.8% + lindane 75%), TF 3607 (TBZ 1.6% + thiram 4.8% + lindane 40%), TF 3752 (flutriafol 1.25% FL), spotless 25 WP (diniconazole), CGF 4280 (moncut 51.9 WP), CGA 449 20 WS, Ridomil 35 SD (metalaxyl), Polyram 7 D (metiram 7%), HWG 1608 25 FS, Rovral ST (iprodione 16.7% + lindane 50%), Epic 50.9 FL (furmecyclox), and vitavax 75 WP (carbathiin).

METHODS: 100 g seed lots of certified Westar were treated two weeks before seeding at the rates given in the table below. The test design was a 4-replicated RCB with two 6 m rows per plot. Two hundred seeds and 1 g of Furadan 10G were planted in each row.

The test was done twice. The initial test site was located in N.E. Saskatchewan in a commercial field were blackleg-infested stubble was present.

The second site was established later in Saskatoon because of lack of infection in the first test. Treflan at 1.0 kg a.i./ha was applied 3 days before seeding in both test sites. The Saskatoon test was irrigated regularly to establish a good plant canopy. The test was inoculated 3 weeks after seeding with pycnidiospores of L. maculans; each plot received 120 ml of a suspension containing 5000 conidia per ml. One cm of water was then applied twice a week to promote infection.

Emergence counts on 2 rows/plot in test 1 were done 5 weeks after seeding, and disease ratings on 1 row/plot in test 2 were done 6 weeks after seeding. The data was analyzed using ANOVA and the Waller-Duncan's test was used to determine significant differences among treatments.

RESULTS: See table below.

CONCLUSIONS: No significant differences in % emergence occurred among treatments in test 1. In test 2, the disease level was not significantly reduced by any treatment.

Treatment	Rate (per kg seed)	% Emergence (Test 1)	% DRAT** (Test 1)
UBI 2369-1	22.5 ml P	49.5 a*	8.3 ab
UBI 2451	21.0 ml P	53.6 a	10.3 ab
UBI 2417-1	20.5 ml P	45.3 a	4.8 b
UBI 2402-1	20.0 ml P	43.9 a	4.7 b
Tf 3607	28.0 ml P	51.5 a	7.0 ab
Tf 3752	0.1 ml P	57.1 a	9.9 ab
Tf 3752	0.2 ml P	56.4 a	10.2 ab
Spotless	0.05 g a.i.	46.8 a	7.2 ab
Spotless	0.025 g a.i.	53.6 a	13.4 a
Spotless	0.0125 g a.i.	48.9 a	9.6 ab
CGF 4280	3.75 g a.i.	52.5 a	6.7 ab
CGA 449	0.4 g a.i.	52.4 a	9.5 ab
CGA 449 + Metalaxyl	0.4 + 2.0 g a.i.	53.4 a	8.1 ab
Metalaxyl	2.0 g a.i.	46.1 a	6.4 ab
HWG 1608 025 FS	0.01 g a.i.	49.8 a	3.9 b
HWG 1608 025 FS	0.02 g a.i.	51.0 a	8.2 ab
HWG 1608 025 FS	0.03 g a.i.	47.9 a	6.3 ab
Polyram 7 D	4.0 g a.i.	46.4 a	6.6 ab
Rovral ST		49.4 a	7.0 ab
Epic + Vitavax + Ridomil	3.5 + 1.0 + 0.35	46.6 a	7.5 ab
Check		56.1 a	8.2 ab
Standard Error		4.0	3.7

* Values within a column followed by the same letter are not significantly different according to Waller-Duncan's test (P=0.05).

** Percent disease rating.

CROP: Rapeseed, cv. Tobin

PESTS: *Pythium ultimum*, *Rhizoctonia solani*, *Fusarium* spp.

TITLE: SEED TREATMENTS FOR CONTROL OF DAMPING-OFF, ROOT ROT AND FLEA BEETLES IN CANOLA

MATERIALS: ALIETTE (fosetyl-Al) 80 WP, BAYTAN D (triadimenol) 10 DU, BAYTAN L (triadimenol) 7.5 L, BENLATE (benomyl) 50 WP, CAPTAN (captan) 50 WP, DEXON (fenaminosulf) 70 WP, FURADAN (carbofuran) 10 CR, FURADAN FI SEED TREATER (MBC + thiram + carbofuran) 41 F, GALBEN (benalaxyl) 20 WP, GAMMASAN PLUS (MBC + thiram + lindane) 50 F, GAMMASAN PLUS (benomyl + captan + lindane) 38.5 WP, GUS-80502 80 DF, LINDANE (BHC) 75 WP, PP-450 (flutriafol) 1.25 F, RIDOMIL (metalaxyl) 35 SD, RH-3866 24.5 EC, RIZOLEX (tolclofos-methyl) 50 WP, ROVRAL (iprodione) 50 WP, ROVRAL PLUS (iprodione + lindane) 67 F, SAN-518 (oxadixyl + mancozeb) 64 WP, TERRACHLOR (quintozene) 75 WP, THIRAM (thiram 75 WP), UBI-2342 (triflumazole) 30 WP, VITAVAX RS blue (carbathiin + thiram + lindane) 81 F, VITAVAX RS pink (carbathiin + thiram + lindane) 60 F.

METHODS: Treated seed was sown with a cone seeder at 3-4 cm depth in 2-row plots, May 23, 1986, at Beaverlodge. Plots were 5 m long at 23 cm spacing. A randomized block design with 6 replicates was used. Establishment counts were made after 4 weeks. The day after seeding a laboratory germination test was started on 4 X 50 seeds/treatment. August 20, 10 plants/plot were pulled at random and rated for root rot. Ratings were converted into % yield loss estimates.

NAME AND AGENCY:

DAVIDSON, J.G.N.
Agriculture Canada Research Station
BEAVERLODGE, Alberta T0H 0C0

RESULTS: The results are summarized in the table below. Insecticides (A) and fungicides (B) are shown separately for clarity, but were all part of the same test.

CONCLUSIONS: Damping-off pressure was moderate, but flea beetle pressure was light. However, some of the low overall establishment was due to dessication.

No treatment improved laboratory germination, but both formulations of BAYTAN significantly reduced it.

There were no significant differences amongst the insecticides. The data suggest that LINDANE and GUS-80502 were somewhat toxic. However, this was not noted in previous tests (1984 p. 280, 1986 p. 200).

Only VITAVAX RS pink and RIDOMIL + RIZOLEX significantly improved establishment, whereas rather oddly VITAVAX RS blue had no effect. Ten of the best 12 treatments by average were mixtures containing a fungicide active only against zoosporic fungi, indicating the overriding importance of *P. ultimum* at this site.

No treatment significantly affected root rot, although SAN-518, DEXON + TERRACHLOR (ii), GAMMASAN PLUS (F), and RIDOMIL + PP-450 reduced it by 20-40% on average.

This is the second time that FURADAN FI SEED TREATER has given unsatisfactory results (see 1986, p. 200), suggesting phytotoxicity.

TREATMENT	RATE g ai/kg	GERMINATION (laboratory) %	ESTABLISHMENT %	ROOT ROT Yield loss %
A. Insecticides				
FURADAN	50.0	95 ab*	17.4 bcde	30.9 ab
GUS-80502	5.0	91 ab	11.4 de	35.8 a
LINDANE	7.5	95 ab	10.8 de	32.2 ab
Check (LINDANE + FURADAN)	7.5 + 50.0	95 ab	10.6 de	27.3 ab
Check (untreated)	--	96 a	15.8 bcde	31.6 ab
B. Fungicides (all with LINDANE at 7.5 g ai, except GAMMASAN as noted, and all with FURADAN at 50 g ai)				
VITAVAX RS pink	0.5 + 1.0 + 7.5	94 ab	27.4 a	28.8 ab
RIDOMIL + RIZOLEX	0.3 + 2.0	91 ab	27.0 a	28.4 ab
RIDOMIL + CAPTAN	0.3 + 0.3	94 ab	25.6 ab	30.1 ab
RIDOMIL	0.3	91 ab	24.4 ab	31.8 ab
RIDOMIL + PP-450	0.3 + 0.05	91 ab	23.2 abc	25.9 b
RIDOMIL + UBI-2342	0.3 + 0.9	93 ab	22.4 abc	31.8 a
RIDOMIL + BENLATE + VITAVAX (i)	0.3 + 2.5 + 0.5	93 ab	22.2 abc	28.8 ab
GALBEN	0.3	95 ab	20.8 abcd	26.4 ab
SAN-518	1.0 + 7.0	92 ab	20.4 abcd	22.0 b
DEXON + TERRACHLOR (i)	1.0 + 1.85	94 ab	19.4 abcde	32.4 ab
DEXON + TERRACHLOR (ii)	0.5 + 0.92	96 a	17.9 abcde	25.8 b
RIDOMIL + BENLATE + VITAVAX (ii)	0.15 + 1.25 + 0.25	88 ab	17.0 bcde	31.5 ab
RIZOLEX	2.0	95 ab	16.7 bcde	20.4 ab
ALIETTE + ROVRAL	4.0 + 2.5	89 ab	16.4 bcde	33.4 ab
GALBEN + CAPTAN	0.3 + 0.3	95 ab	16.2 bcde	26.1 ab
ROVRAL PLUS	2.5 + 7.4	97 a	16.0 bcde	27.6 ab
VITAVAX RS blue	0.5 + 1.0 + 7.5	92 ab	15.8 bcde	30.8 ab
CAPTAN	1.0	95 ab	15.6 bcde	33.9 ab
BAYTAN D	0.15	86 b	15.6 bcde	36.5 a
RH-3866 + RIDOMIL	0.6 + 0.3	94 ab	15.0 bcde	30.5 ab
GAMMASAN PLUS (WP)	1.7 + 3.0 + 14.4	94 ab	14.3 cde	32.4 ab
THIRAM	1.0	96 a	13.3 de	35.0 ab
GAMMASAN PLUS (F)	1.7 + 1.7 + 14.2	96 a	12.2 de	25.9 b
BAYTAN L	0.15	87 b	9.9 e	27.0 ab
FURADAN FI SEED TREATER	2.5 + 2.5 + 13.2	94 ab	8.3 e	28.8 ab

* Values followed by the same letter are not significantly different, P=0.05 (Duncan's Multiple Range Test).

CROP: Canola cv. Westar

PEST: Damping-off or seedling blight *Rhizoctonia solani*, *Fusarium* spp. *Pythium* spp.

TITLE: EVALUATION OF SEED TREATMENT FUNGICIDES TO CONTROL SEEDLING BLIGHT OF CANOLA.

MATERIALS: CGA-449 (unknown); CGF-4320 (unknown); Metalaxyl; Rovral ST (iprodione, 167 g/l + lindane, 500 g/l); TF-3607 (lindane, 512 g/l + thiabendazole, 20 g/l + thiram, 60 g/l); UBI-2369-1 (carbathiin, 45 g/l + lindane, 680 g/l + thiram, 90 g/l); UBI-2417-1 (carbathiin, 49 g/l + lindane, 732 g/l + metalaxyl, 17 g/l); UBI-2451 (carbathiin, 48 g/l + lindane, 714 g/l + metalaxyl, 17 g/l + TBZ, 7 g/l).

METHODS: Canola seed, 100 g, was treated with individual fungicidal treatments in erlenmeyer flasks (500 ml) on May 7, 1987. Individual flasks were agitated briskly to obtain uniform coverage of seeds. The batches treated with flowable formulations were allowed to dry before seeds were weighed out for planting. Seeds treated with CGA-449, metalaxyl and CGF-4320 were supplied by CIBA-GIEGY. In the field test, the seed was planted on May 12. Approximately 200 seeds were planted per row in 4 row plots, 6 m x 1.2 m, replicated 4 times in a randomized complete block. About 2 g of ground barley artificially infected with *R. solani* (anastomosis group AG2-1) was added with the seed for each row. Emergence counts were taken on May 25 on 5 m sections of each of the inner two rows discounting 0.5 m sections from each end of the plot. The same 5 m sections were straight combined to determine yield and plant stand on September 22.

NAME AND AGENCY:
KHARBANDA, P.D.
TURNBULL, G.
Alberta Environmental Centre
Bag 4000
Vegreville, Alberta T0B 4L0

In the growth chamber test, pasteurized soil-mix (soil:peat:sand, 1:1:1) was infested with ground barley artifically infected with *R. solani* (anastomosis group AG2-1). Fifty treated or untreated seeds were planted 2 cm deep in the infested soil in 15 cm-diameter pots; an additional treament of untreated seed in uninfested soil-mix was also included. The treatments were replicated 4 times in a completely randomized block in a growth chamber maintained at temperature regimes of 20°C days and 10°C night, and photoperiod of 16h/day. First emergence counts were taken at 10 days and the final seedling stand at 4 weeks after planting.

RESULTS: Results are presented in Table below.

CONCLUSIONS: The disease pressure was apparently uniform throughout the field plots. UBI treatments and TF-3607 significantly improved emergence. The treatments CGA-449, metalaxyl and CGF-4320 seemed to be phytotoxic. Though there were significant differences in plant stand among different treatments, there was no significant improvement in yield with any treatment compared with check.

Growth chamber test gave results similar to those of the field test. However, due to high variability among replications, treatment differences were not significant except for Rovral ST, which gave significantly better stand compared with untreated check.

	TREATMENT	RATE (product/ kg seed)	FIELD TEST* MEAN PERCENT EMERGENCE	FIELD TEST* MEAN PERCENT STAND	FIELD TEST* MEAN YIELD(g)	GROWTH CHAMBER TEST* MEAN PERCENT EMERGENCE	GROWTH CHAMBER TEST* MEAN PERCENT STAND
1.	UBI-2369-1	22.5 ml	44.0 abc	41.0 abc	532.0 b	91.5 a	37.5 bc
2.	UBI-2451	22.5 ml	53.2 a	46.7 a	562.1 ab	96.0 a	57.0 abc
3.	UBI-2417-1	22.5 ml	48.6 ab	42.2 ab	567.3 ab	90.5 ab	57.0 abc
4.	CGA-449	40 g/100 kg	15.4 f	14.2 e	628.3 a	59.5 d	40.5 bc
5.	METALAXYL	200 g/100 kg	17.7 ef	18.3 de	539.9 ab	47.0 d	24.0 c
6.	CGF-4320	240 g/100 kg	22.5 ef	23.1 de	628.0 a	58.5 d	26.0 c
7.	TF-3607	28.0 ml	39.8 bc	35.8 bc	600.7 ab	88.5 ab	45.0 bc
8.	ROVRAL ST	30.0 ml	36.0 cd	32.9 c	628.7 a	75.0 c	78.0 ab
9.	CHECK	UNTREATED	27.8 de	22.8 de	583.4 ab	78.0 bc	24.0 c
10.	CHECK	UNTREATED, UNAMENDED SOIL	-	-	-	94.5 a	95.5 a

* Means of 4 replications; column means followed by the same small letter do not differ significantly according to Duncan's Multiple Range Test (P = 0.05).

CROP: Canola cv. Tribute (Brassica napus)

PEST: Pre-emergence damping-off and root rot, Rhizoctonia solani

TITLE: EFFECT OF 5 PRE-EMERGENCE HERBICIDES ON PRE-EMERGENCE DAMPING-OFF AND ROOT ROT OF CANOLA CAUSED BY RHIZOCTONIA SOLANI AG 2-1 AND AG 4.

MATERIALS: Avadex BW (triallate 39.9%), Treflan (trifluralin 54.5%), EL 5261 (trifluralin 15.4% + ethal fluralin 15.4%), Sencor (metribuzin 50%), and Bladex (cyanazine 48%).

METHODS: An area in which herbicides and R. solani inoculum had not been used for the previous 2 years was used as the test site. The experimental design was a 4-replicate split plot with herbicide as the main plot effect and R. solani isolate as the subplot effect. All plots were separated by 0.6 m to prevent contamination of adjacent plots. The herbicides were applied to the main plots with a 4-nozzle R & D plot sprayer at a pressure of 207 kPa and a liquid volume of 333 L/ha. The test area was then disced twice to a depth of 10 cm. Rye grain kernels infested with the 2 R. solani isolates were broadcast at a rate of 1 kernel/6.5 cm in the appropriate subplots. A plastic covered box frame was placed around each subplot when the plots were inoculated to prevent contamination of adjacent plots. Before removing the box, the inoculum was raked into the soil, the soil was disced to a 5 cm depth, and then packed. Plots were irrigated (1.25 cm) using overhead irrigation. Ten days after irrigation, four 6 m rows (200 seeds/row) of cv. Tribute were planted in each subplot. The rows were spaced 18 cm apart. Ten percent granular Furadan at the rate of 0.5 g/row was added while seeding.

Emergence counts on 4 rows and disease assessments on two rows were done 25 days after seeding. Herbicide x isolate interactions in terms of % emergence and % healthy stand were examined to compare herbicide x isolate combinations with the herbicide check treatment.

RESULTS: See Table below.

CONCLUSIONS: None of the 5 pre-emergence herbicides had a significant effect on infection of cv. Tribute by either of the 2 R. solani isolates. Although EL 5261 is significantly phytotoxic at the given rate, the levels of emergence and healthy stand are proportionally lower.

NAME AND AGENCY:
McKENZIE, D.L., VERMA, P.R. and GUGEL, R.K.
Agriculture Canada, Research Station
107 Science Crescent
Saskatoon, Saskatchewan
S7N 0X2

Herbicide	Rate kg a.i./ha	Inoculum ag	Percent Emergence	Percent Healthy
Nil*		nil**	63.5	62.7
Nil	---	4	36.3	36.4
Nil		2-1	31.1	28.9
Treflan		nil	62.8	62.9
Treflan	1.1	4	32.7	31.9
Treflan		2-1	28.8	29.3
Avadex		nil	60.7	56.6
Avadex	2.2	4	33.3	29.6
Avadex		2-1	21.5	22.1
EL 5261		nil	44.0	37.9
EL 5261	1.1	4	20.7	18.0
EL 5261		2-1	19.7	18.8
Bladex		nil	67.9	66.9
Bladex	1.0	4	33.8	33.7
Bladex		2-1	28.8	27.8
Sencor		nil	67.5	66.6
Sencor	0.3	4	36.3	34.8
Sencor		2-1	24.8	22.6
STANDARD ERROR			3.8	4.1

* no herbicide incorporated into soil.
** no inoculum added to the soil.

CROP: Canola cv. Westar (Brassica napus L.)

PEST: Damping-off, root rot, Rhizoctonia solani

TITLE: COMPARISON OF THE EFFICACY OF SEED TREATMENT FUNGICIDES FOR CONTROL OF RHIZOCTONIA PRE-EMERGENCE DAMPING-OFF OF CANOLA, 1987.

NAME AND AGENCY:
VERMA, P.R. and McKENZIE, D.L.
Agriculture Canada, Research Station
107 Science Crescent
Saskatoon, Saskatchewan
S7N 0X2

MATERIALS: UBI 2369-1 (carbathiin 4.5% + thiram 9% + lindane 67.5%), UBI 2451 (carbathiin 4.8% + TBZ 0.7% + metalaxyl 1.7% + lindane 71.4%), UBI 2417-1 (carbathiin 4.9% + metalaxyl 1.7% + lindane 73.2%), UBI 2402-1 (carbathiin 5% + thiabendazole 0.8% + lindane 75%), TF 3607 (TBZ 1.6% + thiram 4.8% + lindane 40%), TF 3752 (flutriafol 1.25% FL), spotless 25 WP (diniconazole), CGF 4280 (moncut 51.9 WP), CGA 449 20 WS, Ridomil 35 SD (metalaxyl), Polyram 7 D (metiram 7%), HWG 1608 25 FS, Rovral ST (iprodione 16.7% + lindane 50%), Epic 50.9 FL (furmecyclox), and vitavax 75 WP (carbathiin).

METHODS: Certified canola seed was treated in 100 gram lots at the rates given in table below, following a procedure reported previously (Pesticide Research Report, 1983, p. 235). Seed was packaged and seeded within 7 days of treatment. The test was planted on May 11 at a rate of 200 seeds/6m row with 18 cm row spacing. Two hundred rye grains infested with a virulent Rhizoctonia solani AG2-1 isolate were added to each row. Treatments were replicated four times in a randomized complete block. Five percent granular Furadan 10G, at the rate of 1g/6m row was added to all treatments during seeding. On June 9, all seedlings from the entire length of the two rows were counted. The adult plants were also examined for root rot and because the incidence was low it is not being reported. Analysis of variance was carried out and significant differences between means determined using Duncan-Waller means test DWMT).

RESULTS: See table below.

CONCLUSIONS: All fungicides except Polyram, HWG 1608 at 0.02 g a.i./kg, TF 3752 (both rates) and Ridomil, significantly improved emergence (= reduced pre-emergence damping-off). Rovral ST and a formulation containing Epic + Ridomil + Vitavax gave the highest emergence; all UBI formulations and CGF 4280 also gave an excellent control of pre-emergence damping-off.

TREATMENT	RATE (g a.i./kg seed)	MEAN % EMERGENCE/ 6m ROW
Epic + Ridomil + Vitavax	3.5 + 0.35 + 1.0	66.1 a*
Rovral ST	30.0 (Product)	65.2 a
UBI 2402-1	20.0 (Product)	58.9 b
UBI 2451	21.0 (Product)	57.8 b
UBI 2369-1	22.5 (Product)	56.8 b
CGF 4280	3.75	55.4 b
UBI 2417-1	20.5 (Product)	54.8 b
CGA 449 + Ridomil	0.4 + 2.0	45.6 c
CGA 449	0.4	40.5 cd
Spotless	0.05	40.4 cd
TF 3607	28.0 (Product)	34.8 de
Spotless	0.025	31.7 ef
HWG 1608	0.03	30.1 efg
Spotless	0.0125	28.2 fgh
HWG 1608	0.01	24.9 ghi
Polyram 7 D	4.0	23.6 hij
HWG 1608	0.02	23.4 hij
TF 3752	0.2	19.5 ijk
Check	-	18.6 jk
TF 3752	0.1	18.1 jk
Ridomil	2.0	13.8 k
Standard Error of Means		2.43

* Means followed by the same letter are not significantly different at 5% level as determined by DWMT.

CROP: Canola cv. Westar (Brassica napus L.)

PEST: Damping-off, root rot, Rhizoctonia solani

TITLE: COMPARISON OF THE EFFICACY OF 3 SEED TREATMENT RATES OF RIZOLEX WITH AND WITHOUT CARBATHIIN AND CARBATHIIN + THIRAM COMBINATIONS FOR CONTROL OF RHIZOCTONIA PRE-EMERGENCE DAMPING-OFF OF CANOLA, 1987.

MATERIALS: Rizolex 49.7 FL (tolclofos-methyl), UBI 2369-1 (carbathiin 4.5% + thiram 9% + lindane 67.5%) and UBI 2410 (carbathiin 6.44% + lindane 48.28%).

METHODS: Three rates of Rizolex were tested in combination with one rate of carbathiin or carbathiin + thiram. Certified canola seed treated with different fungicide combinations at the rates given in the table below were supplied by Uniroyal Chemical, Elmira, Ontario. The test was planted on May 11 at a rate of 200 seeds/6 m row with 18 cm row spacing. Two hundred rye grains infested with a virulent Rhizoctonia solani AG2-1 isolate were added to each row during seeding. Treatments were replicated four times in a randomized complete block. Emergence counts for two entire rows of each treatment plot were done on June 10. The incidence of root rot in adult plants was found to be very low and thus not being reported here. Data were analyzed using analysis of variance procedures. Duncan-Waller K-ratio t-test was done to compare treatment means; orthogonal contrasts were also done to assess efficacy of various constituents in some of the fungicide formulations.

NAME AND AGENCY:
VERMA, P.R. and McKENZIE, D.L.
Agriculture Canada, Research Station
107 Science Crescent
Saskatoon, Saskatchewan
S7N 0X2

RESULTS: See table below.

CONCLUSIONS: All fungicide formulations significantly improved emergence (= reduced pre-emergence damping-off) relative to the non-treated or lindane-only-treated checks. The orthogonal comparison analyses indicate that the three concentrations of rizolex had equal effect on emergence. Rizolex formulations containing UBI 2369-1 improved emergence more than those containing UBI 2410; but these were not significantly higher than the formulations consisting of rizolex alone or UBI 2369-1 alone.

TREATMENT	RATE (g a.i./kg seed)	MEAN % EMERGENCE/ 6m ROW
Rizolex + Lindane	2 + 15	66.8 abc*
Rizolex + Lindane	3 + 15	66.5 abc
Rizolex + Lindane	4 + 15	66.3 abc
Rizolex + UBI 2369-1	2 + 2 + 1 + 15	70.5 a
Rizolex + UBI 2369-1	3 + 2 + 1 + 15	66.8 abc
Rizolex + UBI 2369-1	4 + 2 + 1 + 15	69.0 ab
Rizolex + UBI 2410	2 + 2 + 15	64.3 cd
Rizolex + UBI 2410	3 + 2 + 15	67.3 abc
Rizolex + UBI 2410	4 + 2 + 15	60.4 d
UBI 2369-1	2 + 1 + 15	64.9 bc
Lindane - Check	15	21.3 e
Non-treated Check	—	16.9 f
Standard Error of Means		1.66

* Means followed by the same letter are not significantly different at 5% level as determined by Duncan-Waller K-ratio t-test.

CROP: Canola cvs. Tobin and Westar

PEST: Seedling blight; Rhizoctonia solani, Fusarium spp.; Pythium spp.

TITLE: TO COMPARE THE RELATIVE EFFICACY OF TOLCLOFOS-METHYL (RIZOLEX) AND TOLCLOFOS-METHYL TANK-MIX COMBINATIONS FOR THE CONTROL OF SEEDLING DISEASES OF CANOLA.

MATERIALS: Lindane; Rizolex (tolclofos-methyl-50%); Vitavax WP (carbathiin, 75%); Vitavax RS Flowable (carbathiin, 45 g/l + thiram, 90 g/l + lindane, 675 g/l).

METHODS: The field test was carried out with cv. Tobin. Treated and untreated seed was planted on May 12, 1987 in 6 m x 1 m plots, containing 4 rows, 20 cm apart. Each row contained 100 seeds planted 2.5 cm deep. The treatments were replicated 4 times in a randomized complete block. Emergence counts were taken on 5 m sections of the inner two rows on May 25, and the stand count on August 24. The same row-sections were used to determine yield; the plots were straight combined on August 24.

In the growth chamber test, pasteurized soil-mix (soil:peat:sand, 1:1:1) was infested with ground barley artificially infected with Rhizoctonia solani (anastomosis group AG2-1). Fifty treated or untreated seeds of cv. Tobin or cv. Westar were planted 2 cm deep in the infested soil in 15 cm-diameter pots; an additional treatment.

NAME AND AGENCY:
KHARBANDA, P.D.
TURNBULL, G.
Alberta Environmental Centre
Bag 4000
Vegreville, Alberta T0B 4L0

of untreated seed in uninfested soil-mix was also included. The treatments were replicated 4 times in a completely randomized block in a growth chamber maintained at temperature regimes of 20°C days and 10°C night, and photoperiod of 16h/day. First emergence counts were taken at 10 days and the final seedling stand at 3 weeks after planting.

RESULTS: Results are presented in Table below.

CONCLUSIONS: In the field test, none of the treatments, even the standard Vitavax RS, improved emergence or yield over check.

In the growth chamber test, all treatments containing tolclofos-methyl significantly improved emergence in cv. Westar compared with check; several of those treatments significantly improved emergence in cv. Tobin as well. Disease control response due to treatments was better in cv. Westar than in cv. Tobin. Larger seed of cv. Westar with larger surface area perhaps retains more fungicide per seed than that by cv. Tobin seed. As in our other growth chamber tests in the past, Vitavax RS did not perform well.

TREATMENT	RATE g product/ kg seed	FIELD TEST (TOBIN)* MEAN** PERCENT EMERGENCE	MEAN** PERCENT STAND	MEAN YIELD(g)	GROWTH CHAMBER TESTS* TOBIN† MEAN % EMERGENCE	MEAN % STAND	WESTAR† MEAN % EMERGENCE	MEAN % STAND
1. RIZOLEX + LINDANE	2.0 + 15.0	44.5 a	45.8 a	391.5 a	88.5 a	76.5 ab	84.0 a	69.0 ab
2. RIZOLEX + LINDANE	3.0 + 15.0	53.5 a	52.0 a	401.2 a	90.5 a	82.0 ab	83.5 a	74.5 a
3. RIZOLEX + LINDANE	4.0 + 15.0	58.3 a	62.3 a	365.9 a	87.0 a	85.0 ab	80.5 ab	84.5 a
4. RIZOLEX + VITAVAX + LINDANE	2.0 + 2.0 + 15.0	54.1 a	54.6 a	481.6 a	90.5 a	91.5 a	82.5 ab	83.5 a
5. RIZOLEX + VITAVAX + LINDANE	3.0 + 2.0 + 15.0	61.1 a	60.1 a	467.5 a	87.5 a	89.5 a	81.0 ab	83.5 a
6. RIZOLEX + VITAVAX + LINDANE	4.0 + 2.0 + 15.0	58.8 a	56.4 a	427.2 a	85.0 a	90.5 a	82.0 ab	76.5 a
7. RIZOLEX + VITAVAX RS FL	2.0 + 1.0 + 2.0 + 15.0	70.4 a	67.8 a	493.0 a	84.0 a	72.5 ab	83.5 a	85.5 a
8. RIZOLEX + VITAVAX RS FL	3.0 + 1.0 + 2.0 + 15.0	71.5 a	62.5 a	460.7 a	88.0 a	70.0 ab	79.5 ab	82.0 a
9. RIZOLEX + VITAVAX RS FL	4.0 + 1.0 + 2.0 + 15.0	72.9 a	72.3 a	442.0 a	93.5 a	87.5 ab	83.0 ab	82.5 a
10. VITAVAX RS FLOWABLE	22.5 mL/kg	72.4 a	69.1 a	468.9 a	91.0 a	62.0 b	75.5 ab	49.0 bc
11. CHECK (LINDANE)	15.0	65.0 a	61.3 a	471.5 a	89.0 a	37.0 c	70.0 b	26.5 c
12. CHECK (LINDANE) WITH UNAMENDED SOIL	15.0	-	-	-	90.0 a	89.0 a	82.5 ab	83.5 a

* Mean of 4 replications. Column means followed by the same letter do not differ significantly according to Duncan's Multiple Range Test (P = 0.05).

** Emergence was taken at 3 weeks, and stand at swathing.

† Treatment 12 is a healthy check which did not contain a Rhizoctonia in soil. Emergence was taken at 10 days and stand at three weeks after planting.

CROP: Canola, cv. Westar

PEST: Stem rot, Sclerotinia sclerotiorum (Lib.) de Bary.

TITLE: APPLICATION TECHNOLOGY AND CONTROL OF SCLEROTINIA STEM ROT OF CANOLA WITH BENLATE, 1987.

MATERIALS: BENLATE 50 WP (benomyl)

METHODS: A commercial crop in east-central Saskatchewan was selected for the plots on the basis of a moderately good stand and the presence of abundant apothecia. The plots were set up and sprayed on July 8, when the crop was at early bloom. Treatments consisted of a non-factorial combination of two nozzle types, three fungicide dosages, two volumes of carrier fluid and three spray boom heights (see Table). All applications were made with a tractor-drawn sprayer, custom built and operated by Rogers Engineering Inc. of Saskatoon, Saskatchewan. The spray boom was mounted to one side of the tractor and variations in carrier volume were achieved by varying tractor speed and nozzle type. All treatments were applied at 300 KPa.

The plot design was a three-replicate randomized complete block, modified by the placement of a non-sprayed check in every fourth plot. Thus, in addition to 11 spray treatments each block contained three check plots. Each plot was 10 m x 2 m and separated from adjacent plots in the block by either a 1 m strip or a 4 m alleyway along which the tractor was driven.

On August 19-20, when the crop was nearing maturity, disease incidence was assessed by counting the percentage of infected plants in a sample of 200 plants from the centre of each plot. In two replicates, disease severity was also assessed, but since the results provided no additional insights, they are not presented here. The data were analyzed by ANOVA and Duncan's multiple range test.

NAMES AND AGENCY:
MORRALL, R.A.A. and VERMA, P.R.
respectively Department of Biology, Univ. of Saskatchewan, Saskatoon, Saskatchewan, S7N 0W0 and Agriculture Canada Research Station, 107 Science Crescent, Saskatoon, Saskatchewan, S7N 0X2.

RESULTS: See table. Favorable weather for infection and disease development throughout July and August resulted in disease incidence values in the check plots of 30-40%. All 11 treatments resulted in a high level of control but there were few significant differences among specific spray treatments.

CONCLUSIONS: Under the conditions of this experiment Benlate gave good control of stem rot at 0.125 kg ai /ha (25% of the recommended dose), particularly with 11001 spray nozzles. There were no clear effects of spray boom carrier volume on efficacy of control. Although the differences were not significant, the treatments giving the three lowest disease incidence values were all applied with 11001 nozzles. Thus, there was an indication that small spray droplets generated by 11001 nozzles may improve control with Benlate. These and previous results (Morrall et al., 1984 P.R.R.) strongly suggest that further work is justified to develop application technology that will permit good control of stem rot with low fungicide doses and low carrier volumes.

Incidence of sclerotinia stem rot in relation to fungicide dose and method of application.

Dose of Benlate (kg a.i./ha)	Volume of Carrier Fluid (L/ha)	Height of Spray boom above canopy* (cm)	Nozzle Type	Disease incidence **
0 (check)	--	--	--	35.6 a ***
0.125	50	10	8015	11.1 b
0.250	100	60	8015	7.8 bc
0.500	50	10	8015	6.2 bc
0.125	100	10	8015	6.1 bc
0.250	100	10	8015	5.2 bc
0.250	50	10	8015	5.2 bc
0.500	100	10	8015	4.0 bc
0.250	100	30	8015	3.5 bc
0.125	50	10	11001	3.0 bc
0.250	50	10	11001	2.2 bc
0.500	50	10	11001	1.2 c

* Measured from the tips of the tallest inflorescences.
** Means of 3 replications; check was the mean of 3 plots in each of 3 replications (n = 9)
*** Values followed by the same letter are not significantly different at p = 0.05 according to Duncan's multiple range test.

CROP: Canola cv. Westar

PEST: Sclerotinia sclerotiorum

TITLE: EVALUATION OF LATE-BLOOM FUNGICIDE APPLICATION FOR THE CONTROL OF SCLEROTINIA STEM ROT IN CANOLA, 1987.

MATERIALS: BENLATE 50 WP (benomyl)

METHODS: Three fields in east-central Saskatchewan with moderate to heavy stands were selected. In field #1 and in field #2, apothecia were not observed until late-bloom and full-bloom respectively. In field #3 abundant apothecia were present from late-bud onward. Each trial was divided into 24 plots (2m x 5m). Twelve plots were sprayed (0.6 kg a.i./ha) at late bloom. The plots were paired so that a sprayed plot was always adjacent to a check plot. Treatments were applied with a hand applicator (R & D sprayer) at 400 l/ha. and 240 KPa using LF3 80° nozzles. Spray dates were July 9 for field #1 and July 17 for fields #2 and #3.

The trials were assessed for disease a few days before swathing. In fields #1 and #2, plants were pulled from 2 m^2 quadrats in each plot and the percentage of diseased plants was determined. In field #3 a 3 m^2 area was used because of a lower plant density.

NAME AND AGENCY:
RUDE, S.V.; MORRALL, R.A.A.; TURKINGTON, T.K.; KAMINSKI, D.A.
Department of Biology, University of Saskatchewan, Saskatoon, Saskatchewan, S7N 0W0

RESULTS: See table.

CONCLUSIONS: Fungicide application at late-bloom significantly reduced the amount of stem rot in all three fields. Excellent control was achieved when inoculum was not present until full-bloom or later but significant control was achieved even when inoculum was present at the onset of flowering. In field #3 control was less effective since many infections were probably already well developed at the time of application.

It is currently recommended that foliar fungicides to control stem rot should be applied no later than full-bloom. However it is possible to achieve effective control by spraying at late-bloom when the appearance of inoculum is delayed. This may provide a new option for canola growers.

		Field #1	Field #2	Field #3
Percentage of diseased plants*	sprayed	1.7+	4.2+	22.2+
	check	16.8	24.5	36.4
Percentage control **		90	83	39

* all figures represent means of twelve replications

** $\frac{\text{check} - \text{sprayed}}{\text{check}} \times 100$

\+ significantly different from check at P = 0.01 (paired t-test after angular transformation of data)

CROP: Canola cv. Westar (Brassica napus L.)

PEST: Sclerotinia stem rot, Sclerotinia sclerotiorum

TITLE: EVALUATION OF FOLIAR-APPLIED FUNGICIDES FOR THE CONTROL OF SCLEROTINIA STEM ROT IN CANOLA - 1987.

NAME AND AGENCY:
VERMA, P.R., McKENZIE, D.L. and GUGEL, R.K.
Agriculture Canada, Research Station
107 Science Crescent
Saskatoon, Saskatchewan
S7N 0X2

MORRALL, R.A.A., TURKINGTON, T.K., and RUDE, S.V.
Department of Biology, University of Saskatchewan
Saskatoon, Saskatchewan
S7N 0W0

MATERIALS: Benlate 50 WP (benomyl), Easout 50 ULV (thiophanate-methyl), Rovral 25 FL (iprodione), Ronilan 50 FL (vinclozolin), Sportak (Prochloraz 40 EC) Sportak + Enhance Surfactant, PP 523 (hexaconazole 5% granular), PP 450 25 EC (flutriafol), DPX 965 50 DF (carbendazim) and TBZ 45 FL.

METHODS: The trial was conducted in two commercial fields in east-central Saskatchewan (Melfort, Carrot River) chosen on the basis of uniform stand, growth stage and presence of apothecia of Sclerotinia sclerotiorum. The treatment plots (6 m x 2 m) were established in a randomized complete block design with four replications. Foliar application with fungicides was made on July 6 (growth stage 4.1) by using an R.D. Plot Sprayer at 276 kPa and 416 L/ha. Disease assessment was done on August 18 when plants were at growth stage 5.2. At one location (Carrot River), where infection was low only the total number of infected plants (200 plants/plot) were recorded. At the second location (Melfort), 200 plants from each treatment plot were pulled and assessed for stem infection by categorizing them into 5 disease categories with 1 and 5 being the healthy and severe categories respectively. The overall disease intensity expressed as "percent disease rating" was calculated following the procedure reported previously (Pesticide Research Report, 1982, p. 238). Analysis of variance was carried out and significant differences between means determined by using Waller-Duncan's K-ratio t-test.

RESULTS: See table below.

CONCLUSIONS: Except PP 450, single applications of all other fungicides significantly reduced both percent infected plants and percent disease ratings when compared with the non-sprayed check. Among the fungicides both Benlate formulations, DPX 965 and Easout reduced the disease most and PP 523 the least.

Fungicide	Treatment Rate (g a.i./ha)	% Infected Plants*	% Disease Rating Location 2**
Benlate WP	500	1.4 a***	0.8 a
Benlate DF	500	2.9 a	1.1 a
DPX 965	500	1.4 a	1.2 a
Easout	750	4.9 a	4.2 ab
Rovral	500	12.9 b	7.0 bc
Ronilan	500	11.9 b	10.5 cd
TBZ	750	12.3 b	10.9 cd
Sportak	300	20.5 c	13.0 de
Sportak + Enhance	500 + 250 ml (Product)	19.3 c	13.6 de
Sportak	400	20.6 c	14.1 de
Sportak + Enhance	300 + 250 ml (Product)	22.7 c	14.5 de
Sportak	500	20.1 c	15.0 e
Sportak + Enhance	400 + 250 ml (Product)	22.2 c	16.2 e
PP 523	250	24.5 c	17.5 e
PP 450	250	43.7 e	33.5 g
Check	-	34.1 d	25.6 f
Standard error of means		2.22	1.92

* Mean of two tests; ** Results of one test.
*** Within column means suffixed by the same letter are not significantly different at the 5% level as determined by Waller-Duncan's K-ratio t-test.

CROP: Canola cv. Westar (Brassica napus L.) and cv. Tobin (B. campestris L.)

TITLE: FIELD EXPERIMENTS ON THE EFFECTS OF COMBINATIONS OF 2 SEED DRESSING FUNGICIDES AND 2 GRANULAR INSECTICIDES ON EMERGENCE OF CANOLA, 1987

MATERIALS: Vitavax RS FL (carbathiin 4.5% + thiram 9% + lindane 67.5%), Rovral ST (iprodione 16.7% + lindane 50%), Furadan CR-10 (carbofuran 10%) and Counter 5G (terbufos 5%)

RATES:

Vitavax RS FL	22.5 ml P/kg seed
Rovral ST	30 ml P/kg seed
Furadan CR-10	2.8 kg P/ha
Counter 5G	11.0 kg P/ha
Seeding rate	5 kg/ha

METHOD: Fifteen combinations of the 2 seed dressing fungicides and the 2 granular insecticides are shown in the attached table. The treatments in which the insecticide was added "at seeding time" means that the insecticide was not stored with the seed, but was applied during seeding. The effect of the duration of the storage period from the time of seed treatment to seeding time was tested by preparing the appropriate seed lots one month and one week before seeding. Seed of cvs. Tobin and Westar were treated with Rovral ST and Vitavax RS in 200 gram lots. Treated and untreated seed was then packaged in seed envelopes (200/envelope). Granular insecticide was added to the packaged seed at the rates given above, i.e., the ratio of seeding rate to insecticide rate, and based on the mean weight of 200 seeds of each cultivar. The seed of the various treatments was stored in separate locations at 15°C.

The test site was an area where canola had not been previously grown. Treflan (1 kg a.i./ha) was applied to the test area two weeks before seeding. The experimental design was a 4-replicate RCB with a factorial arrangement of the seed dressings and granular insecticides. The 4 combinations of cultivars and storage times were tested separately. Each plot consisted of two 6 m rows at 18 cm row spacing with 200 seeds per row. Emergence counts were done every 2-3 days from the 10th to the 20th day after seeding for a total of 5 counts. In order to determine the effects of the pesticide combinations on the rate of emergence, the data were analyzed as a split plot in time with pesticide treatments as the main plot effect and time as the subplot effect. The Waller-Duncan k-ratio t-test was applied to the mean of the % emergence values for the five observation periods. Orthogonal comparisons were also used to find any general trends that the four pesticides may have had on emergence rate. The final % emergence was also analysed using ANOVA.

NAME AND AGENCY:
McKENZIE, D.L., VERMA, P.R. and GUGEL, R.K.
Agriculture Canada, Research Station
107 Science Crescent
Saskatoon, Saskatchewan
S7N 0X2

RESULTS: The results are shown in the attached table. None of the treatments after one week storage delayed the emergence or reduced the final plant count of either cultivar. Westar treated with Vitavax + Counter had a significantly higher rate of emergence than untreated Westar. The final level of emergence of Westar stored one week with the Vitavax + Counter and Vitavax + Furadan combinations was significantly greater than in the untreated check.

Most of the Rovral + granular insecticide combinations after one month storage significantly reduced the emergence rates of both cultivars; the Rovral + Furadan treatment had no effect on Tobin. The emergence rate of Westar was also significantly reduced when seed with no seed dressing was stored with Furadan or with Counter for one month, and also when Counter was added at seeding time.

Seed of both cultivars treated with Rovral and stored one month with Counter, or when Counter was applied at seeding time, had significantly lower final emergence. Tobin treated with Rovral only, and Westar treated with Rovral + Furadan, also had significantly lower final plant counts. Vitavax + Furadan added at seeding time resulted in significantly higher final % emergence for both Tobin and Westar. Tobin treated with Vitavax + Counter, and Westar treated with Vitavax + Furadan or with Vitavax alone, also had a higher final emergence.

The orthogonal contrast analysis showed that there was a trend for the emergence rate of Westar to be reduced when the seed was stored one week with Furadan, and when Counter and Furadan were applied at seeding time. Vitavax and Rovral when applied one week before seeding, and Counter when applied at seeding time, showed a tendency to reduce the emergence rate of Tobin. One month storage of Westar and Tobin treated with Rovral, and of Westar when Counter was applied at seeding time, also tended to reduce the emergence rates.

CONCLUSIONS: The four pesticides displayed varying degrees of phytotoxicity depending on the cultivar, time of application before seeding, and, in the case of the granular insecticides, the method of application. Results of these and our unpublished growth chamber experiments suggest that all pesticides and combinations of pesticides which are applied to or with canola seed should be assessed for toxicity using a procedure which also considers delays in emergence rather than relying only on final emergence counts.

TREATMENT	Westar, 1 week storage		Tobin, 1 week storage		Westar, 1 month storage		Tobin, 1 month storage	
	mean % emergence*	final % emergence	mean % emergence	final % emergence	mean % emergence	final % emergence	mean % emergence	final % emergence
Vitavax + Counter	50.8 a**	67.8 a	42.1 a	49.3 a	55.6 ab	67.1 abc	48.9 a	56.2 a
Vitavax + no insecticide	47.7 ab	59.2 abc	41.4 a	49.6 a	56.6 a	69.8 ab	49.1 a	55.1 ab
Vitavax + Furadan	46.7 abc	61.5 ab	41.0 a	48.1 a	57.3 a	71.1 ab	46.6 ab	53.4 abc
Vitavax + Furadan at seeding time	46.3 abc	59.5 abc	43.2 a	50.9 a	58.7 a	71.6 a	50.0 a	56.9 a
Rovral + no insecticide	45.0 abc	54.1 abc	35.3 a	42.9 a	47.8 cde	58.8 defg	31.4 e	37.0 g
Rovral + Counter	44.1 abc	56.1 abc	37.3 a	45.1 a	42.3 e	54.2 g	35.8 de	41.0 fg
Vitavax + Counter at seeding time	42.8 abc	54.3 abc	36.8 a	43.9 a	53.2 abc	64.8 bcde	47.4 a	54.7 abc
no seed dressing + Counter	41.4 abc	51.4 bc	46.2 a	51.8 a	49.9 bcd	58.2 efg	43.9 abc	46.8 def
no seed dressing + Furadan	40.9 bc	51.9 bc	46.2 a	51.8 a	49.3 cd	58.4 efg	49.2 a	52.2 abcd
no seed dressing + Furadan at seeding time	40.8 bc	53.8 abc	44.4 a	50.3 a	56.4 a	65.3 abcd	45.9 ab	49.5 ab
no seed dressing + no insecticide - control	40.6 bc	47.4 c	48.2 a	53.4 a	56.1 a	62.4 cdef	45.9 ab	50.1 bcde
Rovral + Furadan at seeding time	39.8 bc	51.4 bc	36.5 a	44.5 a	46.7 de	56.7 fg	39.4 cd	45.2 ef
Rovral + Counter at seeding time	38.7 bc	49.9 bc	36.9 a	43.7 a	42.7 e	52.3 g	35.7 de	41.6 fg
no seed dressing + Counter at seeding time	38.1 c	48.6 bc	44.3 a	49.9 a	48.0 cde	58.6 defg	44.5 abc	48.7 cde
Rovral + Furadan	37.4 c	49.5 bc	37.8 a	45.8 a	44.1 de	53.8 g	40.6 bcd	46.7 def
Standard Error	5.9	3.9	10.7	5.0	4.8	2.4	5.1	2.2

* mean of the emergence values obtained from the 5 observation dates.

** means within a column followed by the same letter are not significantly different at P = 0.05 according to Waller - Duncan's k-ratio t-test.

Orthogonal Comparisons of Mean % Emergence	Conclusion			
	Westar, 1 week storage	Tobin, 1 week storage	Westar, 1 month storage	Tobin, 1 month storage
Counter vs no insecticides	no significant trend	no significant trend	significant reduction	no significant trend
Furadan vs no insecticides	significant reduction	no significant trend	significant reduction	significant increase
Counter at seeding time vs no insecticide at seeding time	significant reduction	significant reduction	significant reduction	no significant trend
Furadan at seeding time vs no insecticide at seeding time	significant reduction	no significant trend	no significant trend	significant increase
Rovral vs no seed dressing	no significant trend	significant reduction	significant reduction	significant reduction
Vitavax vs no seed dressing	significant increase	significant reduction	significant increase	significant increase

CROP: Carrots, cv. Chanton and Comet

PEST: Cavity spot, *Pythium* spp.

TITLE: EFFICACY OF PHENYLAMIDE FUNGICIDES FOR THE CONTROL OF CAVITY SPOT OF CARROTS - 1986

MATERIALS: APRON 35 SD (metalaxyl), benalaxyl-thiram, RIDOMIL 5G (metalaxyl)

METHODS: Carrots were seeded with a V-belt seeder in naturally infested organic soil at the Bradford Marsh on June 3. The seed dressings (APRON 35 SD and benalaxyl-thiram) were applied and thoroughly mixed with the seed prior to seeding. The granular fungicide (RIDOMIL 5G) was applied in the seed furrow. A completely randomized design with 4 replicates per treatment was used. Each replicate consisted of 1 6 m row of carrots. The number of carrots to emerge in the centre 1 m of row was counted on July 22. The centre 2 m of row were harvested on October 8. Carrots were washed and rated for cavity spot on a scale of 0 (no cavity spot) to 4 (severe cavity spot, at least one cavity per carrot > 10 mm in width).

NAME AND AGENCY:
MCDONALD, M.R., EDGINGTON, L.V., RIPLEY, B.
Department of Environmental Biology, University of Guelph, Guelph, Ontario, N1G 2W1

RESULTS: See table below. Reduced emergence and yield were recorded at 4.0 kg a.i. of RIDOMIL 5G.

CONCLUSIONS: APRON 35 SD did not provide control of cavity spot. Benalaxyl-thiram reduced cavity spot on the more susceptible cultivar, Chanton. RIDOMIL 5G significantly reduced cavity spot on the more susceptible cultivar, Chanton, and provided some reduction of cavity spot on cv. Comet. Metalaxyl residues in carrots increase with the rate of metalaxyl applied, but there is not correlation between metalaxyl residue and severity of cavity spot.

Treatment	Rate (kg a.i./ha)	Chanton		Comet	
		Disease rating+	Residue (ppm)	Disease rating	Residue (ppm)
1. Untreated Check	0.00	56.1 d*	-	27.5 c	0.015
2. Benalaxyl-thiram	0.002	21.4 bc	-	21.1 bc	0.023
	0.004				
3. APRON 35 SD	0.012	57.0 d	0.02	15.3 abc	0.023
4. RIDOMIL 5G	0.2	22.0 bc	0.02	9.6 ab	0.01
5. RIDOMIL 5G	0.5	24.9 bc	0.045	13.4 abc	0.035
6. RIDOMIL 5G	1.0	18.5 abc	0.055	15.7 abc	0.033
7. RIDOMIL 5G	2.0	21.1 bc	0.065	12.5 abc	0.043
8. RIDOMIL 5G	4.0	22.7 bc	0.1	3.2 a	0.1

\+ Disease rating calculated as follows: $\frac{\text{\# of carrots in class} \times \text{disease class}}{\text{Total \# of carrots} \times 4} \times 100$

* Values followed by the same number are not significantly different - Duncan's New Multiple Range Test.

CROP: Field Corn, Pioneer 3737

PEST: Pink Ear Rot Fusarium graminearum

TITLE: EVALUATION OF FUNGICIDES TO CONTROL PINK EAR ROT IN FIELD CORN

MATERIALS: BRAVO 500 (chlorothalonil), EASOUT 70 WP (thiophanate-methyl), BENLATE 50 WP (benomyl), BAYLETON 50 WP (triadimefon), TILT 250E (propiconazole)

METHODS: The research plot was selected in a grower's corn field which had a history of continuous corn and plants were known to have had ear rot. Plots consisted of single rows, separated by a guard row, spaced 0.9 m apart and 8m in length, arranged in a randomized complete block design with 4 replications. On July 20 the early fungicide treatments were applied at 90% silk and subsequent treatments applied on July 27 at full silk. All treatments were applied using an Oxford precision, hand held sprayer with a single flat fan nozzle (No. 1) in 450 L/ha of water at 345 kPa. Spray was directed at the silks from about 20 cm away from both sides of the plant. On September 28 plots were evaluated for pink ear rot incidence and severity.

NAME AND AGENCY:
SCHAAFSMA, A.W.
Ridgetown College of Agricultural Technology
Ridgetown, Ontario, NOP 2C0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: No treatment provided significant suppression of the disease. Most of the disease appeared to be associated with European Corn Borer damage, so timing may have been too early.

Treatments (Growth Stage)	Rate kg ai/ha	Disease	
		Incidence** (% Ears Infested)	Severity** (Weighted Average)
BRAVO 500 (90% silk)	0.75	63.8abc*	4.40ab
BRAVO 500 (90% silk + 7 days)	0.75 + 0.75	60.0abc	2.95ab
EASOUT 70WP (90% silk)	0.7	51.3bc	3.28ab
EASOUT 70WP (90% silk + 7 days)	0.7 + 0.7	50.0bc	2.93ab
BENLATE 50WP (90% silk)	0.5	46.3c	1.80b
BENLATE 50WP (90% silk + 7 days)	0.5 + 0.5	58.8abc	3.38ab
BAYLETON 50WP (90% silk)	0.250	56.3abc	4.73ab
BAYLETON 50WP (Full silk)	0.250	61.3abc	5.58a
TILT 250EC (90% silk)	0.125	72.5a	5.63a
TILT 250EC (Full silk)	0.125	70.0ab	4.88a
Check		61.3abc	4.20ab

*Values followed by the same letter are not significantly different at the 5% level. (Duncan's Multiple Range Test)
**After Hough and Benoit, 1986

CROP: Lentil, cv. Eston

PEST: Ascochyta blight, Ascochyta fabae f.sp. lentis

TITLE: EVALUATION OF FUNGICIDES TO REDUCE SEED-TO-SEEDLING TRANSMISSION OF ASCOCHYTA, 1986.

MATERIALS: AGROX 24F (Maneb), ALIETTE EXTRA 83.4WP (52.8% fosetyl Al + 17.7% captan + 12.9% thiabendazole), APRON 35SD (metalaxyl), APRON 70SD (35% captan + 35% metalaxyl), BENLATE 50WP (benomyl), MERTECT 41.8F (thiabendazole), ROVRAL ST 70F (52.5% lindane + 17.5% iprodione), UBI 2393 18.8F (17% carbathiin + 1.8% thiabendazole), UBI 2458 15F (7.5% carbathiin + 5% metalaxyl + 2.5% thiabendazole), UBI 2464 6.4F (3.8% metalaxyl + 2.6% thiabendazole), UBI 2475 36.6F (5.6% carbathiin + 31.0% thiabendazole), UBI 2476 35F (3.7% metalaxyl + 31.3% thiabendazole), UBI 2477 37F (5.1% carbathiin + 3.4% metalaxyl + 28.5% thiabendazole), VITAVAX 75 WP (carbathiin).

METHODS: Seed with 91% germination and 27% infection with Ascochyta was used. Four-replicate randomized complete block trials were conducted at Floral and Saskatoon. A non-treated check and 17 seed treatments were tested (see table). All seed was treated in batches of 150g from 28-30/04, subdivided per plot and stored at room temperature until planted.

Plots were seeded on 02/05 at Floral and 08/05 at Saskatoon using a small-plot, tractor-drawn seeder. Plots were 3.7 m long, four rows wide (1.2m) and contained about 39 viable seeds per m row. Cool weather prevailed after seeding at both locations and about 50 mm of rain fell from 9-11/05. Seedling emergence was counted on 3 m lengths of the two centre rows of each plot on 03/06 at Floral and on 06/06 at Saskatoon. The plots at Floral were trimmed to 3 m on 18/08, swathed on 20/08 and combined on 04/09. At Saskatoon the plots were trimmed to 3 m on 19/08, sprayed with a desiccant on 26/08, swathed on 29/08 and combined on 07/09. Harvested seed was cleaned and weighed. The % Ascochyta-infection of harvested seed from Saskatoon was not measured because ascochyta blight had spread into the plots from another experiment nearby. For the Floral location, % seed infection was determined for all plots by plating a 100-seed sample on 20% V8 agar. Data were analysed separately for each location by ANOVA and Duncan's multiple range test.

NAME AND AGENCY:
MORRALL, R.A.A.
Department of Biology, University of Saskatchewan, Saskatoon, Saskatchewan, S7N 0W0

RESULTS: See table. Although the seed planted showed 27% Ascochyta-infection, seedling disease was almost zero even in the check. Consequently, seedling infection with Ascochyta was not assessed. The lack of transmission to the seedling may have been associated with the pathogen being located only in seed components which remain below ground.

ANOVA showed significant effects of fungicides on emergence, but the relative ranking of treatments differed between locations. Few were significantly better than the check. ROVRAL ST was phytotoxic, probably because of lindane in the formulation. Yields were also significantly affected by treatment but the only major effect was with ROVRAL ST. Otherwise yield and emergence were not correlated.

At Floral % Ascochyta-infection of the seed varied significantly; the two highest levels were the check and the APRON 70 treatment. Four treatments, all containing thiabendazole, gave significantly lower values than the check and, in general, thiabendazole-containing treatments gave low values. However, separation of the treatment means was not clear.

CONCLUSIONS: Previous work (Beauchamp and Morrall 1985 P.R.R.) suggested that thiabendazole may reduce seed-to-seedling transmission of Ascochyta in lentil. However, the present tests gave equivocal results due to extremely low transmission from heavily infected seed. Despite this, there was evidence that thiabendazole-containing fungicides caused sufficient differences to be reflected by reduced disease development and infection of harvested seed. Further work is needed using plot designs that reduce interplot spread during the summer and avoid masking treatment differences.

Effect of fungicides on emergence, yield and % Ascochyta infection of harvested seed of Eston lentil

		Saskatoon location		Floral location		
Fungicide	Rate g a.i./kg seed	Emergence (Seedlings/m)	Yield ($kg \times 10^3$/ha)	Emergence (Seedlings/m)	Yield ($kg \times 10^3$/ha)	% Ascochyta* in seed
MERTECT	1.0	22a	2.88abc	25a**	3.13a	2.3bcd
UBI 2464	0.5	17b	2.91abc	23ab	2.95ab	1.3bcd
UBI 2477	3.9	19ab	2.64abc	22abc	2.60abc	0.8cd
ALIETTE EXTRA	2.4	20ab	2.97abc	22abc	3.04a	0.5d
APRON 35	3.3	19ab	2.86abc	22abc	2.83ab	3.3bcd
VITAVAX	1.0	22a	2.86abc	22abc	2.77ab	2.5bcd
BENLATE + APRON 35	0.5 + 0.4	20ab	3.53a	22abc	2.37abc	3.3bcd
UBI 2458	1.1	21ab	3.17abc	22abc	2.46abc	2.0bcd
UBI 2393	0.6	19ab	2.93abc	21bc	2.44abc	0.5d
MERTECT	2.0	19ab	2.28c	21bc	2.39abc	1.0cd
UBI 2476	3.4	22a	2.50bc	20bc	2.37abc	1.3bcd
MERTECT	3.0	21ab	2.72abc	20bc	1.87bc	3.5bcd
AGROX	1.0	20ab	3.34ab	20bc	2.27abc	5.3bc
APRON 70	0.5	17b	3.33ab	20bc	2.09bc	9.5a
UBI 2475	3.4	19ab	3.05abc	20bc	2.35abc	2.0bcd
CHECK	---	18ab	2.63abc	20bc	2.49abc	5.8ab
BENLATE	1.0	20ab	3.19abc	19c	2.54abc	3.0bcd
ROVRAL ST	5.0	10c	1.04d	14d	1.75c	3.0bcd

* Based on plating 100 seeds on 20% V8 Juice agar.

** Values in a column followed by the same letter are not significantly different at p=0.05 according to Duncan's multiple range test.

CROP: Lentil cv. Eston

PEST: Stem rot, Sclerotinia sclerotiorum

TITLE: EFFICACY OF FUNGICIDAL SPRAYS TO CONTROL SCLEROTINIA STEM ROT OF LENTILS.

MATERIALS: Benlate WP (benomyl, 50%); Easout WP (thiophanate-methyl, 70%); PP-523 FL (unknown, 5% a.i.) Rovral FL (iprodione, 25%; Sportak EC (prochloraz, 40%).

METHODS: Lentil seed was planted 4 cm deep, @ 120 seeds per row, in 4 row plots, 6 m x 1.2 m, in a field that was artificially infested with S. sclerotiorum sclerotes in October, 1986. The treatments were replicated 4 times in a randomized complete block. The plots were lightly irrigated as necessary to maintain good growing conditions, and high humidity to facilitate germination of sclerotes. All fungicidal suspensions were freshly prepared prior to application and were applied with a Knapsack sprayer, at a rate of 850 l/ha, at approximately 30 percent flowering stage. Disease was evaluated for the inner two rows of each plot on September 18; a scale of 0-4 (0 = healthy; 1 = 25% plants diseased; 2 = 50% plants diseased; 3 = 75% plants diseased; 4 = 100% plants diseased) was used. The plots were straight combined on September 23, and yield determined.

NAME AND AGENCY:
KHARBANDA, P.D.
TURNBULL, G.
Alberta Environmental Centre
Bag 4000
Vegreville, Alberta T0B 4L0

RESULTS: See table below.

CONCLUSIONS: The disease did not develop uniformly throughout the field, and consequently there was considerable variation among replications. Rovral FL, however, improved yield significantly over check. Efficacy of Sportak EC was considerably improved with the addition of surfactant Enhance.

TREATMENT	RATE (g ai/ha)	MEAN DISEASE SEVERITY*	MEAN YIELD (g)*
1. SPORTAK 40EC	500	1.00 ab	923.7 ab
2. SPORTAK 40EC + ENHANCE (surfactant)	500 + 250 ml/ha	0.45 bc	900.6 ab
3. PP-523 5 F	250	1.28 a	869.4 ab
4. EASOUT 70WP	750	0.53 bc	975.4 ab
5. ROVRAL 25FL	500	0.49 bc	1103.3 a
6. BENLATE 50WP	500	0.24 c	934.7 ab
CHECK		0.75 abc	795.0 b

* Mean of 4 replications; column means followed by the same small letter do not differ significantly according to Duncan's Multiple Range Test (P = 0.05).

CROP: Onions, cv. Canada Maple

PEST: White rot, *Sclerotium cepivorum*, Berk

TITLE: PREPLANTING AND MIDSEASON DRENCHES FOR ONION WHITE ROT IN 1987

MATERIALS: BOTRAN 75 W (dicloran)

METHODS: The experiment was conducted in a 70 m^2 enclosed plot of muck soil which was artificially infested with sclerotia. Plots consisted of 5 rows, 40 cm apart, 2.5 m long and were seeded May 15. A randomized complete block design with 4 replicates was used. The preplanting treatment was applied to the soil as a course spray with a hand sprayer 12 days before sowing onions. The volume of water used was 1200 L/ha and immediately after the soil was treated, the fungicide was worked into the soil at a depth of 4 cm. Drenches were applied on July 9 and August 7 using a volume of 1 L water/m row. Onions were harvested October 23 and disease was rated by counting the number of diseased onion plants and total number of plants per each plot. Percentages were arcsine transformed for analysis of variance.
Location: Holland Marsh, Ontario.

NAME AND AGENCY:
VALDES, E. and EDGINGTON, L.V.
Department of Environmental Biology, University of Guelph, Guelph, Ontario, N1G 2W1

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Significant differences were found between the 3 treatments. BOTRAN 75 W applied as a preplanting treatment decreased white rot incidence. Additional soil drenches during the season improved the performance of this fungicide.

Treatments	Rate (kg Form./ha)	% Disease Incidence*
1. Preplanting only	11	13 A
2. Preplanting + 2 soil drenches	11 + 11	5 B
3. Untreated	--	22 C

* Means followed by the same letter are not significantly different at P=0.05 according to Duncan's Multiple Range Test.

CROP: Dry Peas, cv. Venus

PEST: Sclerotinia sclerotiorum

TITLE: AN EVALUATION OF TWO FUNGICIDES AND TWO APPLICATION METHODS FOR THE CONTROL OF WHITE MOLD ON DRY PEAS, 1987.

NAME AND AGENCY:
HOWARD, R.J. and MOSKALUK, E.R.
Alberta Special Crops and Horticultural Research Center
Bag Service 200
Brooks, Alberta, TOJ OJO

MATERIALS: BENLATE 50% WP (benomyl)
ROVRAL FLO (iprodione 250 g/L)

METHODS: The studies reported here were conducted in an infested field at the ASCHRC, Brooks. Two separate experiments were seeded on May 7 with an eight-row grain drill. The row spacing was 16cm and the seeding rate was ca. 180 kg/ha. The seed was treated with captan fungicide prior to planting. The experimental design used was a randomized complete block with four replications in both the 'aerial' and 'ground' experiments. Individual treatment subplots were 5m by 5m. Barley was seeded June 1 at a rate of 112 kg/ha in the pathways between replicates and around the perimeter of the entire plot. Fungicide applications were begun when the plants were at the early flowering growth stage and the first-formed pods were 2.5-5.0 cm long. A second application was made to designated subplots at the late-flowering stage, when most pods were developed and filling. The fungicides were applied according to two regimes:

1. Aerial - a hand held Tecnoma T1 ultra low volume spinning-disc applicator, equipped with a disc which delivered 1.4 mL/sec with a droplet size of 40-70 microns, was used to apply the fungicides to subplots in a trial designed to simulate aerial spraying. An equivalent of 45 L/ha of fungicide solution was applied to each subplot.

2. Ground - a CO_2-propelled, hand-held boom sprayer, equipped with four #1 fan jets spaced 45 cm apart and operated at 200 kPa, was used to apply fungicides in a way which simulated application by a ground rig sprayer. The volume of spray solution applied was equivalent to 125 L/ha.

The untreated check plots were sprayed with water only a rate of 125 L/ha. Frequent light irrigations were applied up to harvest to create favorable conditions for white mold development. At maturity, $20m^2$ were harvested from each subplot of both the aerial and ground trials. The seed was threshed, air-dried, cleaned, and weighed to obtain yields. The data were subjected to ANOVA.

RESULTS: White mold infestation was uniformly high in all subplots. No significant differences were observed between the various fungicide treatments, or between any of them and the untreated check, for either application regime (see Table). Considerable yield variability was encountered between replicates which increased the ANOVA error term and thus resulted in relatively low F values. One trend which emerged from the data was that the 'ground' method of applying the fungicides appeared to result in higher pea yields than the 'aerial' method.

CONCLUSIONS: Further evaluation of these two application methods may be warranted utilizing more replications and/or larger subplots.

Treatment	Rate (kg a.i./ha)	Yield (kg/ha)[1]	
		Ground method	Aerial method
Rovral Flo (250 g/L SU)	0.75	1602	1400
	0.75 + 0.50	1821	1354
Benlate 50%WP	0.75	1478	1360
	0.75 + 0.50	1414	1526
Check	--	1447	1812

[1] ANOVA ($P \leq 0.05$) was non-significant for treatments within both application regimes. Figures are the means of four replications.

CROP: Soybean var. Pioneer 1677

PEST: Damping off, Pythium spp. and Root rot, Phytophthora megasperma (Drechs) var. Sojae

TITLE: EVALUATION OF FUNGICIDE SEED TREATMENTS FOR CONTROL OF DAMPING OFF AND ROOT ROT IN SOYBEANS, 1987

MATERIALS: AGROSOL T (130 g/L thiram, 3.7 g/L thiabendazole) AGROSOL Pour-on (130 g/L thiram, 3.7 g/L thiabendazole), CHIPMAN B-3 (11% diazinon, 16.5% lindane, 33.5% captan), AGROX DL+M (15% diazinon, 25% lindane, 10.7% metalaxyl), ANCHOR (67 g/L carbathiin, 67 g/L thiram), VITAFLO 280 (14.9% carbathiin, 13.2% thiram), TF 3651 (15% benalaxyl), TF 3723 (15% benalaxyl, 5% imazalil).

METHODS: Seed was treated in jars and mixed on a roller for 15 minutes May 11. The trial was seeded May 13 with a 4 row Kincaid cone seeder. Plots consisted of 2 rows, each 4 meters long with 50 seeds per row. Treatments were replicated 4 times in a randomized block design. Number of seedlings emerged were counted and plots were assessed for vigor and root rot infection.
Location: Rodney, Ontario

NAME AND AGENCY:

SMITH, D.B.
Chipman, A Business Unit of C-I-L Inc.
400 Jones Road
Stoney Creek, Ontario
L8G 3Z1

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Emergence was significantly improved by ANCHOR, AGROSOL T, AGROSOL Pour-on and TF 3723. Vigor was substantially improved by AGROSOL Pour-on and ANCHOR. No significant difference in Phytophthora infection was observed, however, benalaxyl treatments had the fewest diseased plants.

TREATMENT	RATE[1]	EMERGENCE[2]		VIGOR[3]	ROOT ROT[4]
		May 27	June 3	July 24	July 24
AGROSOL T	0.57+0.02 g	78.5 a**	82.1 ab	6.4	6.8 a
AGROSOL Pour-on	0.57+0.02 g	69.2 ab	75.0 abc	7.1	5.8 a
CHIPMAN B-3	0.35+0.53+1.1 g	54.0 bcd	64.8 cd	6.1	6.8 a
AGROX DL+M	0.30+0.50+0.21 g	57.2 bc	64.3 cd	6.8	2.8 a
ANCHOR	0.4+0.4 g	84.4 a	84.9 a	7.0	8.5 a
VITAFLO 280	0.39+0.35 g	66.2 abc	62.0 cd	6.3	5.3 a
TF 3651*	0.30 g	56.8 bc	62.3 cd	6.8	1.3 a
TF 3723*	0.30 g	66.2 abc	68.9 bc	6.8	2.3 a
Check	-	48.6 cd	51.6 d	6.1	6.0 a

1. Active ingredient per kg of seed.
2. Average percent emergence (100 seeds per plot).
3. Vigor rating (1 = very poor, 10 = excellent).
4. Average number of diseased plants per plot.

* Seed pretreated with thiram at 0.57 g ai/kg seed.
** Treatment means in the same column followed by the same letter are not significantly different at the 5% level (t-test).

CROP: Soybean [Glycine max (L.) Merr.] cv. Corsoy 79.

PEST: Phytophthora megasperma f. sp. glycinea (Pmg)

NAME AND AGENCY:
ANDERSON, T. R. AND T. W. WELACKY
Agriculture Canada
Research Station
Harrow, Ontario NOR 1GO

TITLE: EFFECT OF SEED TREATMENT ON EMERGENCE, PLANT LOSS AND YIELD OF SOYBEAN, 1987.

MATERIALS: Vitaflow-280 (carbathiin 16.7% + thiram 14.8%); UBI 2467 (carbathiin 16.7% + thiram 14.8%), UBI 2393-1 (carbathiin 16.7% + thiabendazole 25%), UBI 2395-1 (thiabendazole 24%), Anchor (carbathiin 6.6% + thiram 6.6%), UBI 2498-1 (carbathiin 6.6% + thiabendazole 24%), UBI 2522 (carbathiin 6.6% + metalaxyl 25%), Agrosol T (thiram 13% + thiabendazole 0.037%), Agrosol Pour-on (thiram 13% + thiabendazole 0.037%), Agrosol Flowable (captan 33% + thiabendazole 0.061%), Chipman B-3 (diazinon 11% + lindane 16.6% + captan 33.5%), TF 3621 (captan 25% + benalaxyl 15%).

METHODS: Plots consisted of 4 rows, 4.5 m long, with 400 seed/plot. The test was planted 14/05/87 on Brookston clay loam at Woodslee, Ontario, in a randomized block design with 4 replicates. Emergence counts that included both live and dead seedlings were made 08/06/87. Plant stands were determined 28/09/87 from all plants that produced seed. Percentage plant loss was determined by the formula (emergence-stand/emergence) x 100%. Plots were harvested 08/10/87.

RESULTS: See Table 1.

CONCLUSIONS: Seven treatments improved emergence of Corsoy 79. Emergence of untreated OX20-8 was highest of all treatments indicating that factors other than Pmg may have affected emergence e.g. dry weather. Plant loss in the Corsoy 79 check was higher than in treated plots. Five treatments significantly reduced plant loss compared to the check. Yield was significantly reduced by 1 treatment. The low yield and high plant loss of OX20-8 indicate inoculum of Pmg was presented at the site but infection probably occurred late in the season.

Table 1. Effect of seed treatments on emergence, plant loss and yield of soybean cv. Corsoy 79, resistant to Pmg and line OX20-8 (susceptible check)

Treatment	Rate (mL or g product/kg of seed)	Emergence plant/m	Plant loss (%)	Yield kg/ha @ 14% moisture
1. Check (Corsoy 79)	0	26	11	3797
2. Vitaflow-280	2.6	30	6	4056
3. UBI 2467	1.95	30	5	3710
4. UBI 2393-1	1.95	29	10	2829
5. UBI 2395-1	0.25	29	3	3674
6. Anchor	6.0	31	5	3638
7. UBI 2498-1	6.0	29	5	3638
8. UBI 2522 + UBI 2395-1	4.4 + 1.0	28	2	3829
9. Agrosol T	4.4	32	4	3747
10. Agrosol T	5.8	30	7	3590
11. Agrosol Pour-on	4.4	32	7	3602
12. Agrosol Flowable	1.6	29	2	3642
13. Chipman B-3	3.2	27	8	3710
14. TF 3621	2.2	30	5	3888
15. Check (OX20-8)	0	35	93	130
$\bar{x}$		30	11	3430
% CV		8.9	36.9	11.7
$LSD_{0.05}$		3.8	6.0	571.5

CROP: Soybeans, cv. Corsoy 79

PEST: Fusarium sp. Rhizoctonia sp. root rot

TITLE: SCREENING FUNGICIDES FOR SOYBEAN SEED TREATMENTS TO CONTROL SOIL BORNE SEEDLING DISEASES.

MATERIALS: VITAFLO 280 (carbathiin + thiram), ANCHOR (carbathiin + thiram), AGROX B-3 (diazinon + lindane + captan), UBI-2393-2, UBI-2498, UBI-2467, AGROSOL-T, PCNB (quintozene).

METHODS: On May 21 soybean seeds were planted using a 3 row cone seeder. Plots consisted of 3 rows spaced 0.6 meters apart by 6 meters in length at a rate of 150 seeds per row arranged in a randomized complete block design with 4 replications. Soybeans were treated in 500g lots using a desk top seed treating device supplied by Uniroyal Chemical. Herbicide application consisted of Treflan 545 EC plus Amiben 240 g/L applied ppi at the recommended rates. Estimated plant emergence (cotyledons just visible) was taken on May 29 while total emergence counts per row were taken on June 1. On June 6 plant height was measured to the youngest expanded trifoliate (an average of 10 randomly selected plants per plot). Disease incidence was measured by observing lesions on the hypocotyl and roots of 10 plants. Disease severity was measured as the average severity (0-4 scale) of the 10 plants sampled. Yield was taken from the centre row of each plot on October 14.

NAME AND AGENCY:
SCHAAFSMA, A.W.
Ridgetown College of Agricultural Technology
Ridgetown, Ontario, N0P 2C0

RESULTS: The results are summarized in the table below. There was no significant difference in plant height between treatments.

CONCLUSIONS: PCNB was ineffective for disease control nor did it improve emergence as well as other treatments. Treatments providing disease control also resulted in higher emergence. Any advantage due to higher and more rapid emergence was soon lost due to the compensation ability of soybean plants under the relatively low pressure of disease present.

Treatments	Product /kg seed	% Emergence* May 29	% Emergence* June 1	Yield Tonnes/ha	Disease** Incidence	Disease** Severity***
VITAFLO 280	2.6 ml	30.0bc****	79.8a	3.35a	3.3cd	0.43cd
ANCHOR	6.0 ml	51.5a	80.8a	3.30a	4.5cd	0.75a-d
B-3	3.2 g	46.0ab	66.8c	3.68a	5.5abc	0.88abc
UBI-2393-2	1.95 ml	54.5a	72.0bc	3.40a	4.5cd	0.65bcd
UBI-2498	6.0 ml	47.0ab	72.8bc	3.68a	3.0d	0.38d
UBI-2467	1.95 ml	47.5ab	76.0ab	3.63a	4.8bcd	0.65bcd
AGROSOL-T	4.4 ml	56.5a	78.0ab	3.55a	5.0bcd	0.78a-d
PCNB (quintozene)	1.0 g	50.0ab	39.5d	3.48a	7.0ab	1.10ab
Check		24.0c	33.3e	3.30a	7.5a	1.23a

* % emerged of 150 seeds planted

** Fusarium sp. Rhizoctonia sp. root rot complex isolated courtesy Dr. T. Anderson, Harrow

*** Severity = average severity rating (0-4) of 10 plants, (0 - no lesion, 4 - lesions completely encircling hypocotyl)

**** Values followed by the same letter are not significantly different at the 5% level. (Duncan's Multiple Range Test)

CROP: Soybeans, cv. B152

PEST: Diaporthe sp., Alternaria sp., Fusarium sp. (seed borne)

TITLE: SCREENING FUNGICIDES AS SOYBEAN SEED TREATMENTS FOR THE CONTROL OF SEED BORNE SEEDLING DISEASES.

MATERIALS: VITAFLO 280 (carbathiin + thiram), ANCHOR (carbathiin + thiram), AGROX B-3 (diazinon + lindane + captan), UBI-2393-2, UBI-2498, UBI-2467, AGROSOL-T, PCNB (quintozene)

METHODS: On May 21 soybean seeds were planted using a 3 row cone seeder. Plots consisted of 3 rows spaced 0.6 meters apart by 6 meters in length at a rate of 150 seeds per row, arranged in a randomized complete block design with 4 replications. Soybeans were treated in 500g lots using a desk top seed treating device supplied by Uniroyal Chemical. Herbicide application consisted of Treflan 545EC plus Amiben 240g/L applied ppi at the recommended rates. Estimated plant emergence (cotyledons just visible) was taken on May 29, while actual emergence counts per row were taken on June 1. On June 6 and 14 plant height was measured to the youngest expanded trifoliate (an average of 10 randomly selected plants per plot). Seed used for the test was taken from a previous crop with a high incidence of pod and stem blight. Seed was sent to University of Guelph for fungal isolation and identification. Yield was taken from the centre row of each plot on October 14.

NAME AND AGENCY:
SCHAAFSMA, A.W.
Ridgetown College of Agricultural Technology
Ridgetown, Ontario, NOP 2C0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All treatments significantly improved emergence of soybean plants. PCNB improved emergence but significantly less than other materials. Early plant development, as expressed as plant height, was delayed in the check and PCNB treatments, however, with soybeans' innate ability to compensate this did not affect yield.

Table 1. Fungal Pathogens - Isolated From Seed, Courtesy Dr. R. Hall, University of Guelph

Fungus	Percent
Diaporthe phaseolorum var. caulivora	26
Diaporthe phaseolorum var. sojae	46
Alternaria sp.	24
Fusarium graminearum	4
Fusarium avenaceum	2
Clean seed	5

Seeds were placed on PDA plate for 10 days at 25 C in darkness. 200 seeds were examined (100 seeds per replication).

Table 2. Results of Field Test

Treatments	Product /kg seed	% Emergence* May 29	% Emergence* June 1	Average Plant Height (cm)*** June 6	Average Plant Height (cm)*** July 4	Yield Tonnes/ha October 14
VITAFLO 280	2.6 ml	36.5ab**	68.5bc	7.6a	47.05a	4.07abc
ANCHOR	6.0	54.0a	68.5bc	7.4a	48.88a	4.43a
B-3	3.2 g	29.5abc	79.3a	6.8bc	50.93a	4.35ab
UBI 2393-2	1.95 ml	42.5a	72.3ab	7.4a	50.20a	4.13abc
UBI 2498	6.0	33.5abc	72.3ab	7.4a	48.48a	4.07abc
UBI 2467	1.95	39.0ab	76.5ab	7.3ab	52.45a	3.85c
AGROSOL-T	4.4	41.0a	78.0ab	7.6a	50.33a	4.28abc
PCNB (quintozene)	1.0 g	11.0bc	60.3c	6.7c	46.18a	4.10abc
Check		7.0c	50.8d	6.7c	46.55a	3.93bc

* % emerged of 150 seeds planted

** Values followed by the same letter are not significantly different at the 5% level. (Duncan's Multiple Range Test)

*** 10 plants measured/plot

CROP: Soybean cv. Maple Arrow

PEST: Seed rot, seedling blight and stem canker (Diaporthe phaseolorum var. sojae, Diaporthe phaseolorum var. caulivora and Phomopsis spp.).

TITLE: EFFECT OF FUNGICIDAL SEED TREATMENTS ON PERFORMANCE OF SOYBEAN SEED INFECTED WITH DIAPORTHE AND PHOMOPSIS.

MATERIALS: ANCHOR (carbathiin 66.7 g/l + thiram 66.7 g/l), BENLATE 50 WP (benomyl 50.0%), CAPTAN 50 WP (captan 50.0%), THIRAM 320 F (thiram 32.4%), THIRAM 75 WP (thiram 75.0%), UBI-1373 (carbathiin 75.0%), UBI-2393 (thiram 220.0 g/l + thiabendazole 24.0 g/l), UBI-2467 (carbathiin 220.0 g/l + thiram 220.0 g/l), VITAFLO 250 (carbathiin 25.3%), VITAFLO 280 (carbathiin 14.9% + thiram 13.2%) and VITAVAX P (carbathiin 26.7% + thiram 38.8%).

METHODS: A single lot of soybean seed, cv. Maple Arrow, produced in 1986 was used. More than 80% of the seed were infected by species of Diaporthe and Phomopsis spp. and emergence in pasteurized soil was less than 50%. Fungicide was added to 200 g of seed in glass jars. Jars were shaken during and after the addition of the fungicides to ensure uniform coverage of the seed. Seeds were planted 4 cm deep in clay loam soil at the Arkell Research Station, Ontario on May 22, 1987. Plots containing one row, 5 m long with 100 seeds per row, and separated by two guard rows (healthy seed of cv. Maple Arrow treated with VITAFLO 280) with 0.53 m spacing between rows, were arranged in a Randomized Complete Block Design with 4 replicates. Seedling emergence, including live and dead plants, was counted on June 12. Surviving plants were counted at harvest on September 25. Plants were

NAME AND AGENCY:
XUE, G. and HALL, R.
Department of Environmental Biology
University of Guelph
Guelph, Ontario N1G 2W1

assessed for Diaporthe and Phomopsis infection based on a five-point rating system of coverage of the stem by pycnidia, where 0 = 0%, 1 = 1-5%, 2 = 6-25%, 3 = 26-50% and 4 = more than 50%. A disease severity index was calculated for each replicate from the formula:

$$DSI = \frac{\text{Sum } (n \times k)}{N \times 4}$$

where n = Rating number (0 to 4);
k = Number of plants with specific rating number;
N = Total number of plants assessed

Plants were hand harvested and mechanically threshed. Total seed yield and 1,000-seed weight were adjusted to 13% seed moisture content.

RESULTS: See table below.

CONCLUSIONS: Emergence, survival, and yield of the infected seed were increased and the disease severity index was reduced significantly by each of the 11 fungicides. THIRAM 320, UBI-2467, VITAFLO 280 and VITAVAX P gave the highest levels of emergence and plant survival. The least amount of Diaporthe and Phomopsis infection was observed in the plots where seed had been treated with VITAFLO 280. The highest yields were obtained from seed treated with ANCHOR, VITAVAX P, VITAFLO 280, THIRAM 320, THIRAM 75 and BENLATE. Seed weight was increased significantly by VITAFLO 280 and VITAVAX P.

TREATMENT	RATE (g ai/kg)	EMERGENCE (%)	SURVIVAL (%)	DISEASE-INDEX (%)	YIELD (kg/ha)	1000-SEED WEIGHT(g)
ANCHOR	1.00+1.00	69.0 ab*	67.5 ab	16.0 ab	2314.3 a	177.6 ab
BENLATE 50 WP	2.50	64.5 ab	63.8 ab	19.0 ab	2271.7 a	181.0 ab
CAPTAN 50 WP	0.50	58.8 b	55.5 b	24.0 b	2005.7 b	173.4 b
THIRAM 320 F	2.33	76.5 a	72.3 a	15.5 ab	2276.2 a	176.7 ab
THIRAM 75 WP	1.05	74.0 ab	68.8 ab	16.0 ab	2243.8 a	176.7 ab
UBI-1373	0.55	62.3 ab	60.8 ab	16.0 ab	2181.9 ab	179.2 ab
UBI-2393	0.55+0.06	74.0 ab	72.0 ab	22.5 b	2092.1 b	170.0 b
UBI-2467	0.55+0.55	75.0 a	72.5 a	14.0 ab	2258.5 a	176.6 ab
VITAFLO 250	0.63	70.8 ab	70.5 ab	18.0 ab	2050.2 b	177.6 ab
VITAFLO 280	0.39+0.34	76.0 a	73.3 a	10.5 a	2353.1 a	185.4 a
VITAVAX P	0.69+1.01	72.8 ab	71.8 a	15.5 ab	2315.5 a	183.0 a
Check		41.0 c	40.5 c	32.0 c	1523.8 c	172.4 b

* Values in columns followed by the same letter are not significantly different at the 5% level (Duncan's Multiple Range Test).

CROP: Sweet Corn, cv. Jubilee, Code 40

PEST: Corn rust, Puccinia sorghi

TITLE: CORN LEAF RUST CONTROL IN SWEET CORN

MATERIALS: BRAVO 90DG (chlorothalonil), MANZATE 200, 80DF (80% mancozeb), DITHANE M45 (80% mancozeb), TRITON XR (surfactant), TILT 250EC (propiconazole)

METHODS: Three locations were planted to Jubilee, a moderately susceptible sweet corn cultivar to leaf rust and one location, LOC 4 to Code 40, a rust resistant sweet corn cultivar. Planting dates were as follows; LOC 1, Glansworth, June 1; LOC 2, London, May 31; LOC 3, Exeter, June 4 and LOC 4, London, May 26. Plots were 5 rows, spaced 90 cm. apart, 8m in length replicated 4 times in a randomized complete block design. Spray applications were applied on Aug. 5 and 14 using a back pack airblast sprayer at 240 L/ha of water. Treatments were evaluated on August 23 by rating the amount of leaf damage caused by leaf rust.

NAME AND AGENCY:
PITBLADO, R.E.
Ridgetown College of Agricultural Technology
Ridgetown, Ontario, N0P 2C0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All candidate fungicides effectively reduced the amount of corn leaf rust on the sweet corn cultivar Jubilee. Locations 1 and 3 had sufficient symptoms of leaf rust to evaluate chemical control while Locations 2 and 4 had little to no rust although at location 4 a resistant cultivar was grown. The highest level of control was achieved with the combination DITHANE M45 plus TILT 250EC. The 80DF formulation of MANZATE was statistically less effective than the combination of DITHANE M45 and TILT 250EC at the two locations where rust was observed. BRAVO 90DG, DITHANE M45 + TRITON XR, MANZATE 200 and the combination of TILT 250EC plus DITHANE M45 were all effective in controlling leaf rust. TILT 250EC applied alone was not as consistent providing a high level of control at LOC 3 but was less effective at LOC 1.

Treatments	Rate kg ai/ha	Leaf Rust Disease Ratings (0-10)1/ LOC 1	LOC 2	LOC3	LOC 4
BRAVO 90DG	1.6	8.0ab*	10.0a	7.8ab	10.0a
DITHANE M45 + TRITON XR	1.4 + 0.25% v/v	7.5abc	10.0a	8.0ab	10.0a
MANZATE 200	1.8	8.3ab	10.0a	7.8ab	10.0a
MANZATE 80DF	1.8	7.3bc	10.0a	7.3b	10.0a
TILT 250EC	0.125	6.8cd	10.0a	7.8ab	10.0a
TILT 250EC + DITHANE M45	0.125 + 1.5	8.5a	10.0a	8.8a	10.0a
Check		6.0d	10.0a	5.3c	10.0a

*Values followed by the same letter are not significantly different at the 5% level. (Duncan's Multiple Range Test)

1/ Leaf Rust Disease Ratings 0-10. Average leaf rust ratings at each test location, 0-severe leaf rust damage, leaves yellowed, 10-green healthy rust pustule-free leaves.

CROP: Tomato, cv. H-722

PEST: Early Blight, Alternaria solani, Anthracnose, Colletotrichum coccodes

TITLE: THE EFFECT OF HERBICIDES TANK MIXED WITH FUNGICIDES APPLIED ON A REPEATED SPRAY PROGRAM

MATERIALS: BRAVO 90DG (chlorothalonil), DITHANE M45 (80% mancozeb), SENCOR 500 (metribuzin), LENTAGRAN 45W (pyridate)

METHODS: Tomatoes were transplanted on June 6 at RCAT in single row plots spaced 1.4m apart. Plots were 8m in length and replicated 4 times in a randomized complete block design. The treatments were applied on a regular 10 day spray program using a back pack airblast sprayer in 240 L/ha of water. Dates of application were June 6, July 3, 13, 23, Aug. 4 and 14. Assessments were taken by visually rating the foliage for herbicide damage and disease caused by Early Blight on Aug. 11 and Aug. 31 respectively. Anthracnose was assessed at harvest on Sept. 24 by randomly selecting 100 red fruits per plot.

NAME AND AGENCY:
PITBLADO, R.E.
Ridgetown College of Agricultural Technology
Ridgetown, Ontario, N0P 2C0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: LENTAGRAN 45W tank mixed with either of the two fungicides BRAVO 90DG or DITHANE M45 and applied on a repeated fungicide program caused significant foliar damage and severely reduced tomato yields. LENTAGRAN'S apparent fungicidal activity was due to its repeated defoliation with the subsequent regrowth of new healthy tomato foliage. There was little or no anthracnose wherever LENTAGRAN was used mainly due to the lack of tomato fruit and not its ability to control the disease. Tank mixing SENCOR 500 with fungicides did not cause any loss in yield.

RESULTS:

Treatments	Rate kg ai/ha	Foliar Blight Ratings (0-10)1/	Phytotoxicity Ratings (0-10)2/	% Anthracnose	Yields Tonnes/ha
BRAVO 90DG	1.4	8.3abc*	10.0a	3.3a	37.3a
BRAVO 90DG + SENCOR 500	1.4 + 0.15	8.0abc	10.0a	3.0a	37.3a
BRAVO 90DG + LENTAGRAN 45W	1.4 + 0.45	8.6ab	7.0c	0.0b	3.4c
BRAVO 90DG + SENCOR 500 + LENTAGRAN 45W	1.4 + 0.15 + 0.45	8.8a	5.0d	0.0b	3.1c
DITHANE M45	2.6	7.5c	10.0a	3.3a	36.4a
DITHANE M45 + SENCOR 500	2.6 + 0.15	7.8bc	10.0a	3.3a	38.0a
DITHANE M45 + LENTAGRAN 45W	2.6 + 0.45	8.8a	8.9b	0.3b	9.9c
DITHANE M45 + SENCOR 500 + LENTAGRAN 45W	2.6 + 0.15 + 0.45	7.9abc	8.3b	0.5b	4.3c
SENCOR 500	0.15	6.0d	10.0a	3.0a	41.0a
LENTAGRAN 45W	0.45	8.3abc	6.5c	0.0b	4.1c
Check		5.3d	10.0a	4.0a	26.6b

*Values followed by the same letter are not significantly different at the 5% level. (Duncan's Multiple Range Test)

1/ Foliar Blight Ratings (0-10); 0, no control, foliage severely damaged, 10, complete control

2/ Phytotoxicity Ratings (0-10); 0, severely injured plants defoliated; 10, no effect healthy green leaves

CROP: Tomato, cv. H-722

PEST: Early Blight, Alternaria solani, Anthracnose, Colletotrichum coccodes

TITLE: COMPARISON OF FUNGICIDES USED IN A WEATHER-TIMED SPRAYING PROGRAM TOMCAST IN FIELD TOMATOES II.

MATERIALS: BRAVO 90DG (chlorothalonil), DITHANE M45 (80% mancozeb)

METHODS: Tomatoes were transplanted on June 6 at RCAT in two row plots spaced 1.4m apart. Plots were 8m in length and replicated 4 times in a randomized complete block design. The fungicides were applied at the times indicated using a back pack airblast sprayer in 240 L/ha of water. Treatments 1 and 4 were sprayed on a 7 day interval on June 23, July 2, 7, 14, 21, 28, Aug. 4, 11 and 8. Treatments 2 and 5 were sprayed on July 2, 10, 20, 28, Aug. 4, 10 and 17 based on the TOMCAST weather-timed program developed at RCAT. Treatments 3 and 6 were also sprayed on the TOMCAST program with sprays delayed until 20 rather than 15 disease severity values had accumulated on July 2, 13, 27 and Aug. 12.
Assessments were takenby visually rating the foliar damage caused by Early Blight on Aug. 22 and Sept. 9 and by randomly selecting 100 red fruits per plot at harvest and counting the number of fruits damaged by anthracnose on September 28.

NAME AND AGENCY:
PITBLADO, R.E.
Ridgetown College of Agricultural Technology
Ridgetown, Ontario, N0P 2C0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: The TOMCAST weather-timed spray program using the 15 Disease Severity Values (DSV) interval timings provided equal foliar and fruit anthracnose control compared to the weekly spray program with improved tomato yields. Extending the TOMCAST interval to 20 DSV resulted in less foliar blight control but did not reduce the level of anthracnose control. BRAVO 90DG yields under this later spray regime were high whereas DITHANE M45 yields were significantly lower.

RESULTS:

Treatments	Rate kg ai/ha	Initial Spray DSV[1/]	Additional Appl. Intervals	# of Spray Applications	Foliar Blight Ratings (0-10)[2/] Aug. 22	Sept. 9	% Anthracnose	Yields Tonnes/ha
BRAVO 90DG	1.4	June 23	7 days	9	8.1ab*	1.8ab	2.5a	38.1b
BRAVO 90DG	1.4	45 (July 11)	15 DSV	7	7.6b	7.9ab	2.3a	43.1a
BRAVO 90DG	1.4	45 (July 11)	20 DSV	4	7.8ab	6.0cb	3.3a	42.4a
DITHANE M45	2.6	June 23	7 days	9	8.8a	7.4ab	2.8a	37.5b
DITHANE M45	2.6	45 (July 11)	15 DSV	7	8.3ab	7.3b	2.8a	43.6a
DITHANE M45	2.6	45 (July 11)	20 DSV	4	7.6b	6.1c	2.8a	33.6d
Check				0	6.3c	2.5d	5.8b	27.6c

*Values followed by the same letter are not significantly different at the 5% level. (Duncan's Multiple Range Test)

1/ DSV = Disease Severity Values

2/ Foliar Blight Ratings (0-10); 0, no control, foliage severely damaged, 10, complete control

CROP: Tomato, cv. H 1706

PEST: Early Blight, Alternaria solani, Anthracnose, Colletotrichum coccodes

TITLE: COMPARISON OF FUNGICIDES USED IN A WEATHER-TIMED SPRAYING PROGRAM TOMCAST - IN FIELD TOMATOES I

MATERIALS: BRAVO 90DG (chlorothalonil), DITHANE M45 (80% mancozeb)

METHODS: Tomatoes were transplanted on May 28 at RCAT in two row plots spaced 1.4m apart. Plots were 8m in length and replicated 4 times in a randomized complete block design. The fungicides were applied at the times indicated using a back pack airblast sprayer in 240 L/ha of water. Treatments 1 and 4 were sprayed on a 7 day interval on June 23, July 2, 7, 14, 21, 28, Aug. 4, 11 and 8. Treatments 2 and 5 were sprayed on July 2, 10, 20, 28, Aug. 4, 10 and 17 based on the TOMCAST weather-timed program developed at RCAT. Treatments 3 and 6 were also sprayed on the TOMCAST program with sprays delayed until 20 rather than 15 disease severity values had accumulated on July 2, 13, 27 and Aug. 12.
Assessments were taken by visually rating the foliar damage caused by Early Blight on Aug. 22 and Sept. 9 and by randomly selecting 100 red fruits per plot at harvest and counting the number of fruits damaged by anthracnose on September 28.

NAME AND AGENCY:
PITBLADO, R.E.
Ridgetown College of Agricultural Technology
Ridgetown, Ontario, NOP 2CO

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Foliar disease control was provided using either BRAVO 90DG or DITHANE M45. The extra spray applications used with the 7 day spray schedule did not significantly reduce the foliar diseases compared to the reduced weather-timed spray program. Anthracnose was reduced to a larger extent with the additional spray applications. Yields were improved using both fungicide products regardless of spray program. BRAVO 90DG when used on the TOMCAST weather-timed spray program provided significantly higher yields than the fixed 7 day spray schedule. This was not the case with DITHANE M45. Tomato yields were lower when DITHANE M45 was used on a TOMCAST system with fewer spray applications.

RESULTS:

Treatments	Rate kg ai/ha	Initial Spray DSV[1]/	Additional Appl. Intervals	# of Spray Applications	Foliar Blight Ratings (0-10)[2]/ Aug. 22	Sept. 9	% Anthracnose	Yields Tonnes/ha
BRAVO 90DG	1.4	June 23	7 days	9	8.5a*	7.6ab	4.3b	37.8bc
BRAVO 90DG	1.4	45 (July 11)	15 DSV	7	8.8a	8.6a	7.5a	40.3ab
BRAVO 90DG	1.4	45 (July 11)	20 DSV	4	8.4a	7.6ab	8.3a	46.0a
DITHANE M45	2.6	June 23	7 days	9	8.6a	8.0ab	4.3b	46.3a
DITHANE M45	2.6	45 (July 11)	15 DSV	7	8.6a	7.9ab	7.0a	36.9bc
DITHANE M45	2.6	45 (July 11)	20 DSV	4	8.5a	7.0b	9.3a	33.8cd
Check				0	6.8b	3.1c	30.5c	28.8d

*Values followed by the same letter are not significantly different at the 5% level. (Duncan's Multiple Range Test)

1/ DSV = Disease Severity Values

2/ Foliar Blight Ratings (0-10): 0, no control, foliage severely damaged, 10, complete control

CROP: Field Tomatoes, cv. H2653

PEST: Early Blight, Alternaria solani, Septoria Leaf Spot, Septoria lycopersici, Anthracnose Colletotrichum coccodes

TITLE: SCREENING FUNGICIDES FOR DISEASE CONTROL IN FIELD TOMATOES.

MATERIALS: DIFOLATAN 480F (captafol), BRAVO 500, 90DG (chlorothalonil), DITHANE M45, 80WP F45 (mancozeb), MANZATE 200, 75DF (mancozeb), TILT 250EC (propiconazole), MISTRAL 750EC (fenpropimorph), RONILAN 500F (vinclozolin), ROVRAL 50WP (iprodione), POLYRAM 80DF (metiram), DYRENE (anilazine)

METHODS: Tomatoes were transplanted on May 13 in two row plots spaced 1.25m apart. Plots were 8m in length, replicated 4 times in a randomized complete block design. Spray applications were made with a back pack airblast sprayer at 240 L/ha of water. Dates of application were June 23, July 3, 13, 23, 31 and August 13. Foliar disease assessments were taken on July 16, Aug. 11 and 22 for Early Blight and Septoria Leaf Spot. Anthracnose counts were taken by randomly selecting 100 red fruits per plot at harvest on Aug. 26 - Sept. 1.

NAME AND AGENCY:
PITBLADO, R.E.
Ridgetown College of Agricultural Technology
Ridgetown, Ontario, N0P 2C0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: A number of the fungicides evaluated provided statistically equal levels of foliar disease control. The standard fungicides DIFOLATAN 480F and the various formulations of BRAVO and DITHANE/MANZATE performed well. Significant foliar disease control was observed on August 11 with the higher rates of BRAVO regardless of formulation. This trend continued later on into the season. There were no differences in foliar disease control between the 500 and 90DG formulations of BRAVO nor the 80WP and F45 formulation of DITHANE. MANZATE 200 did not perform as well as the MANZATE 200 75DF formulation nor the rest of the mancozeb type fungicide. Of the remaining treatments many of which are new candidate fungicides for tomatoes or older products being re-evaluated only the combination of TILT 250EC + DITHANE M45 and DYRENE 50WP provided consistent foliar disease control in field tomatoes.

Fruit anthracnose was again controlled by the standard fungicides of DIFOLATAN 480F, BRAVO 500 and 90DG and the single new formulation of MANZATE 200 75DF. The other mancozeb fungicides were less effective in controlling anthracnose. Of the new materials only RONILAN 500F reduced fruit anthracnose to the level of the standard fungicides presently used.

The most effective overall fungicide treatments were DIFOLATAN 480F, BRAVO 500, 90DG, MANZATE 200 75DF, TILT 250EC + DITHANE M45 and RONILAN 500F.

Treatment	Rate kg ai/ha	Foliar Disease Ratings (0-10)1/ August 11	August 22	% Anthracnose	Yield Tonnes/ha
DIFOLATAN 480F	1.4	8.4ab*	7.6a	3.8a	41.0a
BRAVO 500	1.4	8.1bc	6.6abc	8.5abcd	37.0ab
BRAVO 500	1.6	8.7a	7.1ab	5.3ab	38.8a
BRAVO 90DG	1.4	8.2bc	6.9abc	7.5abc	41.5a
BRAVO 90DG	1.6	8.7a	7.1ab	5.3ab	40.8a
DITHANE M45	2.6	8.4ab	6.3abcd	11.3bcdef	39.3a
DITHANE F45	2.6	8.4ab	7.0abc	12.3cdef	39.3a
MANZATE 200	2.6	7.6c	5.0de	15.0efg	35.3ab
MANZATE 200 75DF	2.6	8.6ab	6.8abc	7.8abcd	38.5a
TILT 250EC + DITHANE M45	0.125 + 1.5	8.6ab	6.5abc	11.0bcdef	42.0a
MISTRAL 750EC	0.75	7.6c	6.0bcd	15.8fg	28.8c
RONILAN 500F	0.75	8.3abc	5.5cde	9.5abcde	40.5a
ROVRAL 50WP	0.55	7.7c	5.5cde	25.0h	36.3ab
POLYRAM 80DF	2.6	7.9bc	4.3e	20.0gh	32.5ab
DYRENE 50WP	1.5	8.6ab	6.9abc	13.8def	35.3ab
Check		4.3d	1.3f	35.0i	31.5bc

*Values followed by the same letter are not significantly different at the 5% level. (Duncan's Multiple Range Test)

1/ Foliar Disease Ratings (0-10); 0, no control, foliage severely damaged, 10, complete control

CROP: Field Tomatoes, cv. H2653

PEST: Early Blight, Alternaria solani, Septoria Leaf Spot, Septoria lycopersici, Anthracnose Colletotrichum coccodes

TITLE: FOLIAR AND FRUIT DISEASE CONTROL IN FIELD TOMATOES

MATERIALS: BRAVO 90DG (chlorothalonil), NIAGARA FIXED COPPER (50% copper oxychloride), DITHANE M45 (80% mancozeb), MANZATE 200 75DF (80% mancozeb), BENLATE 50DF (benomyl), TILT 250EC (propiconazole)

METHODS: Tomatoes were transplanted on May 13 in two row plots spaced 1.25m apart. Plots were 8m in length, replicated 4 times in a randomized complete block design. Spray applications were made with a back pack airblast sprayer at 240 L/ha of water. Dates of spraying were June 23, July 3, 13, 23, 31 and August 13. Foliar disease assessments were taken on Aug. 11 and 21 for Early Blight and Septoria Leaf Spot. Anthracnose counts were taken by randomly selecting 100 red fruits per plot at harvest on Aug. 26-Sept. 1.

NAME AND AGENCY:
PITBLADO, R.E.
Ridgetown College of Agricultural Technology
Ridgetown, Ontario, N0P 2C0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Treatments containing BRAVO 90DG or one of the MANCOZEB fungicides, DITHANE M45 or MANZATE 200 75DF, significantly reduced the occurrence of foliar blights and fruit anthracnose. There was little apparent advantage in whether these products were sprayed alone,in combination or alternatively. NIAGARA FIXED COPPER and BENLATE 500DF applied alone throughout the season failed to control the foliar diseases but reduced anthracnose. Highest tomato yields were recorded with the multiple applications of BRAVO 90DG alone followed by either the tank mix of BENLATE 500F and MANZATE 200 75DF or individual applications of these products in the sequence reported.

Treatments	Rate kg ai/ha	Foliar Disease Ratings (0-10)1/ August 11	August 21	% Anthracnose	Yield Tonnes/ha
BRAVO 90DG (6)	1.6	8.9a*	7.5a	1.8a	58.7a
NIAGARA FIXED COPPER 50WP (6)	3.25	7.1b	4.5cd	4.0ab	45.7bc
DITHANE M45 (6)	2.6	8.3ab	5.8abcd	4.0ab	46.7bc
BENLATE 50DF (6)	0.42	5.3c	3.8d	4.8ab	46.3bc
BENLATE 50DF + MANZATE 200 75DF (6)	0.42 + 2.6	7.8ab	6.3abc	3.3a	51.7ab
MANZATE 200 75DF(4); BENLATE 50DF(2)	2.6; 0.42	7.8ab	5.3bcd	2.8a	54.3ab
MANZATE 200 75DF(4); Tilt 250EC (2)	2.6; 0.125	8.6a	6.5abc	1.3a	43.3bc
DITHANE M45 (3); Bravo 90DG (3)	2.6; 1.6	8.6a	6.8ab	2.0a	46.3bc
Check		4.8c	1.8e	19.5c	36.0c

(X) Number of consecutive spray applications

*Values followed by the same letter are not significantly different at the 5% level. (Duncan's Multiple Range Test)

1/ Foliar Disease Ratings (0-10); 0-no control, foliage severely damaged, 10-complete control.

CROP: Field Tomatoes, cv. H2653

PEST: Septoria Leaf Spot, Septoria lycopersici

TITLE: CONTROL OF SEPTORIA LEAF SPOT IN FIELD TOMATOES

MATERIALS: BRAVO 500 (chlorothalonil), DITHANE M45 (80% mancozeb), BENLATE 50WP (benomyl)

METHODS: A commercial tomato field was identified to conduct this trial, a field showing early signs of Septoria Leaf Spot. Plots were two rows spaced 1.52m apart, 33m in length each plot separated by a non treated guard row. Spray applications were made using a modified commercial hydraulic boom sprayer on July 31 and August 5. These specialized Septoria Leaf Spot sprays were in addition to the grower's standard fungicide program sprayed throughout the season. Assessments were taken on August 12 and 17 by rating the degree of Septoria leaf Spot damage to the foliage from four randomized locations within each treatment.

NAME AND AGENCY:
PITBLADO, R.E.
Ridgetown College of Agricultural Technology
Ridgetown, Ontario, N0P 2C0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: The most effective control of Septoria leaf Spot resulted from the back to back sprays of the tank mixed combination of BENLATE 50WP and DITHANE M45. Two applications of BRAVO 500 alone using the rate of 1.9 kg ai/ha also gave acceptable levels of Septoria control. BENLATE 50WP alone or followed with BRAVO 500 apparently allowed other foliar diseases such as Early Blight Alternaria solani to defoliate the plants.

Treatments	Rate kg ai/ha	Foliar Disease Ratings (0-10)1/ August 12	August 17
BENLATE 50WP + DITHANE M45(2)	0.42 + 2.7	8.8a*	8.8a
BENLATE 50WP; BENLATE 50WP	0.42; 0.42	6.5c	6.5c
BENLATE 50WP; BRAVO 500	0.42; 1.9	5.8c	6.8c
BRAVO 500(2)	1.9	7.6b	8.1b
Check		4.8d	3.4d

(X) Number of consecutive spray applications

*Values followed by the same letter are not significantly different at the 5% level. (Duncan's Multiple Range Test)

1/ Foliar Disease Ratings 0-10; 0-no control, foliage severely damaged, 10-complete control

CROP: Miscellaneous

PEST: Sclerotinia sclerotiorum

TITLE: INFLUENCE OF SOIL MOISTURE AND HERBICIDES ON GERMINATION OF SCLEROTIA OF SCLEROTINIA SCLEROTIORUM.

NAME AND AGENCY:
TEO, B.K. and MORRALL, R.A.A.
Department of Biology
University of Saskatchewan
Saskatoon, Saskatchewan
S7N 0W0

VERMA, P.R.
Research Station, Agriculture Canada
Saskatoon, Saskatchewan
S7N 0W0

MATERIALS: A fine sandy loam soil from Asquith, Saskatchewan and five herbicides were used in this experiment. The rates of herbicides used to amend the soil were:

Herbicide	Rate
1) Avadex BW (triallate)	1.4 kg a.i./ha
2) Bladex (cyanazine)	1.0 kg a.i./ha
3) Glean (chlorsulfuron)	22.5 g a.i./ha
4) Sencor (metribuzin)	1.4 kg a.i./ha
5) Treflan (trifluralin)	1.4 kg a.i./ha

METHODS: The experiment was conducted in an inclined box (2.8 m long x 0.7 m wide and 0.33 m deep) containing six 10 cm wide compartments. The inclined box was effective in achieving a gradual soil moisture gradient from wet (0 bar) to dry (-15 bars). After initial stabilization, the soil moisture content in the top 8 cm soil remained relatively constant in all compartments. The bottom 20 cm depth of the entire inclined box contained non-amended soil. The herbicides were mixed thoroughly with dry soil and in each compartment an 8 cm layer amended with one of the herbicides and a non-amended soil as check were placed on top of the non-amended soil. After the soil moisture was stabilized, sclerotia arranged 2 cm apart in a strip of nylon window screening (3 m long and 1 cm wide) were buried 4 cm deep in each compartment. Five strips containing about 600-700 sclerotia were placed in each compartment. The soil was lightly packed so that the sclerotia were in contact with amended soil at different soil moisture levels. To maintain constant soil moisture levels, distilled water was continuously supplied at the lowest end of the inclined box by using a Mariotte bottle. The experiment was carried out at 10°C constant air temperature. A split plot design was used with herbicide as the main plot treatment, soil moisture as subplot treatment. There were 5 replications. Germination of sclerotia was recorded 3 months after burial.

RESULTS: See Table below.

CONCLUSIONS: Analysis of the results within the soil moisture range of -0.1 to -7 bars showed that Bladex applied at the recommended rate significantly reduced germination of sclerotia of S. sclerotiorum compared with the check. There were no significant differences among the check, Avadex, Glean, Sencor and Treflan treatments. The results also showed that there was an interaction between soil moisture and herbicides. Sencor reduced germination of sclerotia more at high than at low soil moisture. Treflan seemed to have little effect at high soil moisture but had some effect at low soil moisture content. Percentages of germination of sclerotia at soil moistures greater than -0.1 and less than -7 bars were very poor and were not analysed.

Herbicide	Matric potentials (bars) -0.1 to -0.2	-0.2 to -0.3	-0.3 to -1	-1 to -3	-3 to -7	Mean
	percentages of germination					
Avadex	16.8	14.2	19.0	21.8	21.6	18.7
Bladex	0.0	4.0	10.0	6.7	6.0	5.5
Glean	20.0	25.0	33.3	21.6	11.1	22.2
Sencor	8.0	13.3	13.8	21.6	22.5	15.9
Treflan	12.8	29.6	30.9	22.5	7.6	20.7
Check	12.7	16.8	16.3	16.3	15.0	15.4
Mean	11.7	17.2	20.7	18.4	14.0	

Standard Error of main plot treatment means ($\pm\sqrt{\text{Error (a)}/rs}$) = $\pm$ 3.71;
Standard Error of subplot treatment means ($\pm\sqrt{\text{Error (b)}/mr}$) = $\pm$1.28;
Where m = no. of main plot treatments, s = no. of subplot treatments and r = no. of replications.

Diseases of Potatoes

Maladies des pommes de terre

Edited by / Révisé par
R.H. Bagnall

CROP: Potatoes, cv. Sebago

PEST: Fusarium sambucinum Fckl. f. sp. Wr 6

TITLE: EFFICACY OF CHEMICAL CONTROL OF POTATO SEED ROT CAUSED BY FUSARIUM SAMBUCINUM - 1987

MATERIALS: Thiabendazole (Mertect-45 F-21 and 42 ppm a.i. solutions), Thiophanate-methyl (Easout-10 D-5 gm/kg seed), Mancozeb (Agrox-16% D-5 gm/kg seed; Dithane-8% D-10 gm/kg seed), RHC 376 (confidential-6.7 gm/kg seed), RHC 377 (confidential-6.7 gm/kg seed), CGA 449 (confidential-5 gm/kg seed), Metalaxyl (Apron-1% D-5 gm/kg seed).

METHODS: Elite 3 seed was used that had received no fall fungicide treatment prior to storage. Immediately prior to cutting and just before planting, the seed was inoculated by immersion for 3 min. in an inoculum suspension (pathogen, Fusarium sambucinum, cultured on potato dextrose agar - approx. 2.5 x 10**3 spores/ml). Fungicide treatments were applied immediately after inoculation by shaking in a plastic bag for 3-5 min. the seed and fungicide treatment. As controls, some seed received only inoculum. Immediately after treating, the seed was hand-planted in 3.0 m rows with 30 cm in-row and 0.9 m between-row spacings in a randomized complete block design with 4 replicate blocks. Planting was completed on May 16 and recommended crop management practices were followed

NAME AND AGENCY:
PLATT, H.W. (BUD)
Agriculture Canada, Research Station
Charlottetown, Prince Edward Island
C1A 7M8

(fertilizer 20-20-10 at 725 kg/ha; herbicides-metribuzin 50WP, 0.8 kg a.i./ha and paraquat 20SN, 0.5 L a.i./ha; fungicides-chlorothalonil 40F, 0.6 L a.i./ha; insecticides-fenvalerate 30EC, 50 ml a.i./ha and endosulfan 50WP, 0.7 kg a.i./ha; top desiccant-diquat 20SN, 0.6 L a.i./ha). Plant emergence, vigor, and disease determinations were made throughout the season. Top desiccant was applied on September 4 and plots were harvested on September 21.

RESULTS: All data was statistically analyzed (see Table below).

CONCLUSIONS: Unusually dry, warm climatic conditions occurred shortly after planting and during the growing season appearing to cause a reduction in the normal level of seed rot and disease development with inoculation of Fusarium sambucinum. Metalaxyl may have caused some phytotoxicity as eye activity was limited where seed rot occurred. Early vigor was significantly reduced with thiophanate-methyl, thiabendazole-42 ppm, CGA-449, metalaxyl, and RHC treatments while only metalaxyl treatment had significant stand reductions. Marketable yield was significantly lower with thiabendazole, metalaxyl, mancozeb-16% and RHC 377.

TABLE 1. EFFECTS OF SPRING FUNGICIDE SEED TREATMENTS ON FUSARIUM SAMBUCINUM SEED ROT - 1987

TREATMENT	EARLY VIGOR (%)	FINAL STAND (%)	HEALTHY PLANTS (%)	SEED ROT (%)	TUBER YIELD (t/ha) 55-85 mm	TUBER YIELD (t/ha) Total
INOCULATED CHECK	87.5	100	100	0.0	23.7	33.3
THIOPHANATE-METHYL	45.0	97.5	100	2.5	19.1	27.2
THIABENDAZOLE-42 PPM	42.5	100	92.5	0.0	11.8	24.0
THIABENDAZOLE-21 PPM	70.0	100	97.5	0.0	14.8	31.4
CGA 449	45.0	100	95.0	0.0	20.3	29.9
METALAXYL	50.0	85.0	91.0	15.0	17.3	25.7
MANCOZEB-16%	37.5	97.5	95.0	2.5	17.2	29.2
MANCOZEB-8%	80.0	100	92.5	0.0	18.9	26.7
RHC 376	40.0	100	95.0	0.0	21.3	35.3
RHC 377	27.0	100	92.5	0.0	16.9	27.2
LSD (P=0.05)	21.0	4.0	N.S.	N.S.	6.1	N.S.

CROP: Potatoes, cv. Hunter

PEST: Fusarium solani (Mart.) Sacc. var. "coeruleum"

TITLE: EFFICACY OF CHEMICAL CONTROL OF POTATO SEED ROT CAUSED BY FUSARIUM SOLANI - 1987

MATERIALS: Thiabendazole (Mertect-45 F-21 and 42 (half and full recommended rate, respectively) ppm a.i. solutions), Thiophanate-methyl (Easout-10 D-5 gm/kg seed), Mancozeb (Agrox-16% D-5 gm/kg seed; Dithane-8% D-10 gm/kg seed), RHC 376 (confidential-6.7 gm/kg seed), RHC 377 (confidential-6.7 gm/kg seed), CGA 449 (confidential-5 gm/kg seed), Metalaxyl (Apron-1% D-5 gm/kg seed).

METHODS: Elite 3 seed was used that had received no fall fungicide treatment prior to storage. Immediately prior to cutting and just before planting, the seed was inoculated by immersion for 3 min. in an inoculum suspension (pathogen, Fusarium solani, cultured on potato dextrose agar - approx. 2.5 x 10**3 spores/ml). Fungicide treatments were applied immediately after inoculation by shaking in a plastic bag for 3-5 min. the seed and fungicide treatment. As controls, some seed received only inoculum. Immediately after treating, the seed was hand-planted in 3.0 m rows with 30 cm in-row and 0.9 m between-row spacings in a randomized complete block design with 4 replicate blocks. Planting was completed on May 16 and

NAME AND AGENCY:
PLATT, H.W. (BUD)
Agriculture Canada, Research Station
Charlottetown, Prince Edward Island
C1A 7M8

recommended crop management practices were followed (fertilizer 20-20-10 at 725 kg/ha; herbicides-metribuzin 50WP, 0.8 kg a.i./ha and paraquat 20SN, 0.5 L a.i./ha; fungicides-chlorothalonil 40F, 0.6 L a.i./ha; insecticides-fenvalerate 30EC, 50 ml a.i./ha and endosulfan 50WP, 0.7 kg a.i./ha; top desiccant-diquat 20SN, 0.6 L a.i./ha). Plant emergence, vigor, and disease determinations were made throughout the season. Top desiccant was applied on September 4 and plots were harvested on September 21.

RESULTS: All data was statistically analyzed (see Table below).

CONCLUSIONS: Unusually dry, warm climatic conditions occurred shortly after planting and during the growing season appearing to cause a reduction in the normal level of seed rot and disease development with inoculation of Fusarium solani. Early vigor was significantly reduced with thiabendazole, CGA-449, and RHC treatment. Significantly fewer healthy plants and total yield reductions were obtained with thiabendazole-42 ppm, CGA-449, mancozeb-16%, and RHC 377. Phytotoxicity due to seed treatment was not a major problem with any of the fungicides.

TABLE 1. EFFECTS OF SPRING FUNGICIDE SEED TREATMENTS ON FUSARIUM SOLANI SEED ROT - 1987

TREATMENT	EARLY VIGOR (%)	FINAL STAND (%)	HEALTHY PLANTS (%)	SEED ROT (%)	TUBER YIELD (t/ha) 55-85 mm	TUBER YIELD (t/ha) Total
INOCULATED CHECK	82.5	97.5	100	2.5	22.6	41.2
THIOPHANATE-METHYL	75.0	100	100	0.0	18.3	38.8
THIABENDAZOLE-42 PPM	57.5	100	95.0	0.0	17.5	36.9
THIABENDAZOLE-21 PPM	45.0	100	100	0.0	17.3	37.9
CGA 449	37.0	97.5	84.0	2.5	22.2	35.7
METALAXYL	77.5	97.5	100	2.5	15.2	37.7
MANCOZEB-16%	65.0	100	95.0	0.0	20.5	37.5
MANCOZEB-8%	72.5	100	97.5	0.0	21.3	38.4
RHC 376	37.0	97.5	100	3.0	21.7	40.0
RHC 377	32.0	100	87.5	0.0	21.6	37.6
LSD (P=0.05)	18.5	N.S.	4.6	N.S.	N.S.	3.6

CROP: Potatoes, cv. Green Mountain

PEST: Phytophthora infestans (Mont.) de Bary

TITLE: EFFICACY OF CHEMICAL CONTROL OF LATE BLIGHT OF POTATOES - 1987

MATERIALS: Mancozeb (Dithane M45-80 WP, 2.25 kg/ha; -37% F, 3.75 L/ha), Maneb (Manzate 200-80% WP, 1.1 and 2.25 kg/ha; -75% DF, 1.2 and 2.3 kg/ha, Chlorothalonil (Bravo 500-40% F, 2.1 L/ha; -90% DG, 1.17 kg/ha), Metiram (Polyram-80% WP, 1.75 and 2.25 kg/ha), Metalaxyl/Mancozeb (Ridomil MZ-72% WP, 2.4 kg/ha), BAS 222-28F (confidential -80% F, 1.75 and 2.25 kg/ha).

METHODS: For each treatment, four replicate plots consisting of five rows (7.5 m in length, spaced 0.9 m apart) were established in a randomized complete block design. All five-row plots were separated by two buffer rows for tractor operations. Whole (35-55 mm), greensprouted, Elite 3 seed tubers were hand-planted 30 cm apart on May 19. Fertilizer (20-20-10) was banded at a rate of 725 kg/ha. Pre-emergence herbicides (metribuzin 50 WP at 0.8 kg a.i./ha and paraquat 20 SN at 0.5 L a.i./ha) were applied on June 2 and insecticide (fenvalerate 30 EC at 50 ml a.i./ha and endosulfan 50 WP at 0.7 kg a.i./ha) applications were made as required.

Plant emergence counts on the center row of each five-row plot were made on June 24. To the foliage of plants in the outer two rows of each five-row plot, a sporangial suspension (approx. 15,000/ml) of Phytophthora infestans (races 1-4) was applied on July 22 and 29 and August 6. Plots were irrigated (3-5 mm/hr) for 2-4 hr on most weekdays from July 22 to August 28. Disease severity ratings (amount of diseased foliar tissue as a percent of total plant foliage) of

NAME AND AGENCY:
PLATT, H.W. (BUD)
Agriculture Canada, Research Station
Charlottetown, Prince Edward Island
C1A 7M8

plants in the center row of each plot was determined during August and September. Fungicide applications (tractor- mounted sprayer modified to spray only the center 3 rows, 3 hollow-cone nozzles/row, 700 L/ha volume, 820 kPa) were first made on July 21 and then every 7 days. For the combination fungicide treatments, the 3 spray fungicide was applied on of the following dates: July 21, 28, and August 12; the companion fungicide was used on all other spray dates. For split rate treatments, the first rate was applied on the first two spray dates while the higher rate was used on all other dates. Plots were top killed on September 15 and hand-harvested, graded, and assessed for late blight tuber rot damage on September 25.

RESULTS: All data was subjected to an analysis of variance and mean separation tests (see Table 1). No significant differences in plant emergence were obtained.

CONCLUSIONS: Due to the drought conditions during July and August, late blight development was quite slow and late blight tuber rot incidence was very limited. The chlorothalonil, mancozeb and metalaxyl/mancozeb-3 spray + mancozeb treatments had the least amount of defoliation while maneb-DF and BAS 222 had the greatest. Maneb-WP and metiram had intermediate levels of foliar damage due to late blight. For both marketable and total yield and for late blight tuber rot, significant treatment differences were limited partly due to the influence of the dry growing conditions. BAS 222 had significant yield reductions and metiram had a significant increase in tuber rot incidence.

TABLE 1. EFFECTS OF FOLIAR FUNGICIDE TREATMENT ON LATE BLIGHT DEVELOPMENT AND TUBER YIELDS - 1987

TREATMENT/SPRAY SCHEDULE	PERCENT DEFOLIATION (Day/Month) 17/8	25/8	3/9	11/9	TUBER YIELDS (t/ha) 55-85 mm	Total	TUBER ROT (t/ha)
CHLOROTHALONIL-F/7 DAY	0.5	1.0	2.5	6.8	29.6	47.2	0.07
CHLOROTHALONIL-DG/7 DAY	0.5	0.8	3.3	6.5	31.8	46.8	0.00
MANEB-WP/7 DAY	0.3	1.3	5.0	13.5	30.5	47.0	0.00
MANEB-DF/7 DAY	4.0	4.5	15.5	27.5	28.5	46.1	0.07
MANCOZEB-WP/7 DAY	0.0	0.3	0.8	6.0	31.8	50.6	0.00
MANCOZEB-F/7 DAY	0.0	0.0	1.0	4.5	35.5	49.9	0.00
METIRAM-WP/7 DAY	3.8	5.0	7.5	14.5	33.2	48.8	0.32
BAS 222-F/7 DAY	5.0	6.0	11.3	26.5	24.6	43.6	0.00
METALAXYL/MANCOZEB -WP/3 SPRAYS + MANCOZEB-WP/7 DAY	0.0	0.0	1.3	5.3	34.6	50.1	0.00
CHECK	33.8	62.5	78.8	87.5	15.1	37.3	0.04
LSD (P=0.05)	6.3	5.5	7.5	14.9	7.6	5.1	0.13

CULTURE: Pomme de terre cv. Montagne Verte

ENNEMI: Mildiou, Phytophthora infestans (Mont.) de Bary.

TITRE: ESSAI DE LUTTE CONTRE LE MILDIOU DE LA POMME DE TERRE

NOMS ET ORGANISME:
TARTIER, L. et LAPLANTE, R.
Service de recherche en phytotechnie
M.A.P.A.Q.
SAINT-HYACINTHE, Québec J2S 7B8

PRODUITS: Doses d'emploi à l'hectare. Mancozèbe (MANZATE 200 DF, 75%), 2.25 kg; métiram (POLYRAM 80-W, POLYRAM 80-W DF), 2.25 kg; métalaxyl-chlorothalonil (RIDOMIL MZ BRAVO), 2.2 kg; métalaxyl (RIDOMIL MZ 72 W), 2.5 kg; métalaxyl-mancozèbe (RIDOMIL MZ 72W + MANZATE 200, 80W), 0.625 kg + 1.5 kg, application à dose réduite et à intervalles plus courts.

METHODE: Le dispositif expérimental consistait en 7 traitements répartis au hasard et à cinq répétitions à Ste-Clotilde et à L'Assomption. Chaque parcelle comprenait quatre rangs de 12 mètres de long, 1 mètre entre les rangs. Les fongicides ont été appliqués à l'aide d'un pulvérisateur à la pression de 2000 KPa et un débit de 200 l/ha. Le défanage a été effectué le 3 septembre et les récoltes les 28 et 29 septembre respectivement à L'Assomption et Ste-Clotilde.

RESULTATS: Le mildiou est apparu le 12 août pour se développer lentement et affecter 22.5% du feuillage des parcelles témoins. A l'Assomption le mildiou est apparu plus tôt soit le 24 juillet, mais il a évolué plus lentement pour atteindre 14.52% du feuillage juste avant le défanage. Les traitements fongicides ont bien protégé le feuillage et les tubercules et ont permis d'obtenir des rendements supérieurs aux parcelles témoins non-traitées.

Traitements et doses d'emploi à l'hectare	Dates des traitements fongicides	Rendement sain (kg) Tubercules n° 1 (2 x 12 m rang)	% mildiou sur feuillage (2 sept.) Echelle Barratt-Horsfall
L'ASSOMPTION			
RIDOMIL MZ 72W, 2.5 kg	20 juillet, 3,17,31 août	88.2 a	0.46
POLYRAM 80-W, 2.25 kg	20, 27 juillet, 3, 10, 17, 24,31 août	84.8 a	0.93
RIDOMIL MZ 72W, 0.625 kg + MANZATE 200, 80-W, 1.5 kg	20, 27 juillet 3, 10, 17, 24, 31 août	83.4 a	0.0
RIDOMIL-BRAVO, 2.2 kg	20 juillet 3, 17, 31 août	77.0 a b	0.0
POLYRAM 80-W DF, 2.25 kg	20, 27 juillet 3, 10, 17, 24, 31 août	73.0 a b	1.40
MANZATE 200 DF, 2.25 kg	20, 27 juillet 3, 10, 17, 24, 31 août	69.6 a b	0.93
Témoin	----------	61.6 b	14.52
SAINTE-CLOTILDE			
RIDOMIL MZ 72W, 2.5 kg	20 juillet 3, 17, 31 août	83.0 a	0.46
MANZATE 200 DF, 2.25 kg	20, 27 juillet 3, 10, 17, 24, 31 août	82.0 a	0.46
RIDOMIL-BRAVO, 2.2 kg	20 juillet 3, 17, 31 août	80.2 a	0.46
POLYRAM 80-W DF, 2.25 kg	20, 27 juillet 3, 10, 17, 24, 31 août	79.8 a	0.93
RIDOMIL MZ 72W, 0.625 kg + MANZATE 200 80-W, 1.5 kg	20, 27 juillet 3, 10, 17, 24, 31 août	77.4 a	0.00
POLYRAM 80-W, 2.25 kg	20, 27 juillet 3, 10, 17, 24, 31 août	73.8 a	0.46
Témoin	----------	54.4 b	22.50

CROP: Potatoes, cv. Superior

PEST: Rhizoctonia solani Khun

TITLE: EFFICACY OF CHEMICAL CONTROL OF RHIZOCTONIA SOLANI IN POTATOES - 1987

NAME AND AGENCY:
PLATT, H.W. (BUD)
Agriculture Canada, Research Station
Charlottetown, Prince Edward Island
C1A 7M8

MATERIALS: Mancozeb (Agrox 16% a.i. D-5 gm/kg seed), PCNB (Terrachlor 75% a.i. WP-15 ml (8.87% sol'n)/kg seed, Validomycin A (Solacol 3% a.i. F-15 ml (3% sol'n)/kg seed, Thiabendazole (Mertect 45% a.i. F-15 ml (2.35% or 4.7% sol'n=half and full recommended rate, respectively)/kg seed), Pencycuron (Monceren 2.5% a.i. D-15 g/kg seed), Iprodione (Rovral 50% a.i. WP-15 ml (6% sol'n)/kg seed), Tolclofos-methyl (Rizolex 50% a.i. WP-15 ml (0.4% sol'n)/kg seed and 10% a.i. D-50 g/kg seed), Thiophanate-methyl (Easout 10% a.i. D-5 g/kg seed), CGA 449 (confidential 10% a.i. D-5 g/kg seed), NNF 136 (confidential 1.5% a.i. D-5 g/kg seed).

METHODS: Freshly cut healthy (Elite 3) seed, which had not been treated the previous fall or during storage with fungicides, was treated immediately prior to planting by shaking the seed and fungicide in a plastic bag for 3-5 min. Each seed was placed on top of 50 ml of inoculum source (pathogen cultured on sterilized wheat kernels) and covered by soil A randomized complete block design of four replicate blocks was used with 4.5 m row lengths, 0.9 m between-row and 30 cm in-row spacing. Recommended crop production practices were followed: fertilizer 20-20-10, 725 kg/ha; herbicides-metribuzin 50WP, 0.8 L a.i./ha and paraquat 20SN, 0.5 L a.i./ha; fungicides-chlorothalonil 40F, 0.6 L a.i./ha; insecticides-fenvalerate 30EC, 50 ml a.i./ha and endosulfan 50WP, 0.7 kg a.i./ha; top desiccant-diquat 20SN, 0.6 L a.i./ha). Plant emergence, vigor, and disease determinations were made during the season. Top desiccant was applied on September 4 and plots were harvested on October 7. All data was subjected to analysis of variance and mean separation tests.

RESULTS: See table below.

CONCLUSIONS: Warm, dry weather conditions shortly after planting and during the growing season appeared to influence the normal development and expression of disease. Most fungicide treatments provided significant early plant growth enhancement and no seed treatments appeared to cause phytotoxicity problems. No significant treatment differences were obtained for final stand, healthy plant and seed rot determinations. Typical growing season symptoms, such as stem girdling and aerial tubers, were not observed this year but instead an "early dying" symptom type was seen. Fungicide seed treatment did significantly affect tuber yields. Thiabendazole-21 ppm and Pecycuron had significant increases in whole seed-size tuber (< 55 mm) yields while only Pecycuron had significant increases in total yield. Results on blackscurf incidence are being gathered.

TABLE 1. EFFECTS OF SPRING FUNGICIDE SEED TREATMENTS ON RHIZOCTONIA DISEASE DEVELOPMENT AND YIELD

TREATMENT	EARLY VIGOR (%)	FINAL STAND (%)	HEALTHY PLANTS (%)	TUBER YIELD (t/ha) <55mm	55-85 mm	Total
INOCULATED CHECK	65.0	100	92.5	13.1	18.6	31.7
THIABENDAZOLE-42 PPM	82.5	100	97.5	17.8	16.4	34.3
THIABENDAZOLE-21 PPM	85.0	100	97.5	20.7	15.2	35.9
MANCOZEB	77.5	100	100	12.1	22.1	34.2
PENCYCURON	85.0	100	97.5	19.4	14.4	33.8
TOLCLOFOS-METHYL-10%	95.0	100	97.5	17.8	15.3	33.2
TOLCLOFOS-METHYL-50%	85.0	100	100	15.5	19.3	34.8
PCNB	80.0	100	100	18.0	17.2	35.3
VALIDOMYCIN-A	77.5	100	95.0	11.7	18.7	30.5
IPRODIONE	93.0	100	100	16.0	15.9	31.9
THIOPHANATE-METHYL	75.0	97.5	92.0	11.4	18.9	30.3
CGA 449	75.0	100	100	13.3	18.4	31.7
NNF 136	85.0	100	100	14.9	20.0	34.9
LSD (P=0.05)	13.59	N.S.	N.S.	5.00	N.S.	3.67

CROP: Potatoes, cv. Kennebec

PEST: Verticillium albo-atrum Reinke & Berth

TITLE: EFFICACY OF CHEMICAL CONTROL OF POTATO WILT CAUSED BY VERTICILLIUM ALBO-ATRUM - 1987

MATERIALS: Thiabendazole (Mertect-45 F-21 and 42 (half and full recommended rate, respectively) ppm a.i. solutions), Thiophanate-methyl (Easout-10 D-5 gm/kg seed), Mancozeb (Agrox-16% D-5 gm/kg seed; Dithane-8% D-10 gm/kg seed), RHC 376 (confidential-6.7 gm/kg seed), RHC 377 (confidential-6.7 gm/kg seed), CGA 449 (confidential-5 gm/kg seed), Metalaxyl (Apron-1% D-5 gm/kg seed).

METHODS: Elite 3 seed was used that had received no fall fungicide treatment prior to storage. Immediately prior to cutting and just before planting, the seed was inoculated by immersion for 3 min. in an inoculum suspension (pathogen, Verticillium albo-atrum, cultured on potato dextrose agar - approx. 2.5 x 10**3 spores/ml). Fungicide treatments were applied immediately after inoculation by shaking in a plastic bag for 3-5 min. the seed and fungicide treatment. As controls, some seed received only inoculum. Immediately after treating, the seed was hand-planted in 3.0 m rows with 30 cm in-row and 0.9 m between-row spacings in a randomized complete block design with 4 replicate blocks. Planting was completed on May 16 and recommended crop management practices were followed (fertilizer 20-20-10 at 725 kg/ha;

NAME AND AGENCY:
PLATT, H.W. (BUD)
Agriculture Canada, Research Station
Charlottetown, Prince Edward Island
C1A 7M8

herbicides-metribuzin 50WP, 0.8 kg a.i./ha and paraquat 20SN, 0.5 L a.i./ha; fungicides-chlorothalonil 40F, 0.6 L a.i./ha; insecticides-fenvalerate 30EC, 50 ml a.i./ha and endosulfan 50WP, 0.7 kg a.i./ha; top desiccant-diquat 20SN, 0.6 L a.i./ha). Plant emergence, vigor, and disease determinations were made throughout the season. Top desiccant was applied on September 4 and plots were harvested on September 21.

RESULTS: All data was statistically analyzed (see Table below).

CONCLUSIONS: Unusually warm, dry climatic conditions occurred shortly after planting and during the growing season appearing to cause a reduction in the normal level of wilt and disease development with inoculation of Verticillium albo-atrum. Early vigor was significantly reduced with CGA-449 and both RHC seed treatments. Final stand and healthy plant ratings were significantly less for the CGA-449 treatment. However, CGA-449 and RHC 376 had the least amount of wilt while metalaxyl had the greatest. Marketable tuber yields were significantly reduced with the thiabendazole treatments while total yield was significantly less with CGA-449 and RHC 377. Seed rot was generally not a problem except for CGA-449 where evidence of limited eye activity may have been due to a phytotoxicity problem.

TABLE 1. EFFECTS OF SPRING FUNGICIDE SEED TREATMENTS ON POTATO WILT (VERTICILLIUM ALBO-ATRUM) - 1987

TREATMENT	EARLY VIGOR (%)	FINAL STAND (%)	HEALTHY PLANTS (%)	WILTED PLANTS (%)	TUBER YIELD (t/ha) 55-85 mm	TUBER YIELD (t/ha) Total
INOCULATED CHECK	95.0	100	100	21.3	27.9	42.5
THIOPHANATE-METHYL	97.5	100	100	20.0	26.2	42.9
THIABENDAZOLE-42 PPM	90.0	100	100	30.0	20.6	42.0
THIABENDAZOLE-21 PPM	95.0	100	97.5	32.0	19.1	39.0
CGA 449	32.0	72.5	70.0	0.0	22.7	28.8
METALAXYL	82.5	100	97.5	35.0	26.6	39.5
MANCOZEB-16%	95.0	100	100	27.0	25.9	39.6
MANCOZEB-8%	97.5	100	100	25.0	30.9	41.6
RHC 376	67.5	100	100	5.0	29.4	40.4
RHC 377	70.0	100	97.5	20.0	29.8	37.7
LSD (P=0.05)	13.5	3.75	3.5	11.8	5.3	3.7

CULTURE: Pomme de terre cv. Kennebec

ENNEMI: Flétrissure verticillienne, Verticillium albo-atrum Reinke & Berth.

TITRE: ESSAI DE LUTTE CONTRE LA FLETRISSURE VERTICILLIENNE

NOMS ET ORGANISME:
TARTIER, L. et LAPLANTE, R.
Service de recherche en phytotechnie
M.A.P.A.Q.
SAINT-HYACINTHE, Québec J2S 7B8

PRODUITS: Doses d'emploi par 100 kg de tubercules tranchés sauf où mentionné. Methyl-thiophanate (EASOUT 10%), 500 g; CGA 449, 500 g; mancozèbe (TUBERSEAL 16%),500 g; thiabenzole (MERTECT F 45%), 13.3 ml + 200 ml d'eau sur tubercules entiers.

METHODE: Le dispositif expérimental consistait en six traitements répartis au hasard et à quatre répétitions. Chaque parcelle comprenait 2 rangs de 5 mètres, 1 mètre entre les rangs. La semence fraichement coupée a été inoculée avec une suspension conidienne de V. albo-atrum contenant 10 x 10^6 spores par ml. Après incubation pendant 24 heures dans des sacs de polyethylène, la semence a été traitée avec les fongicides et immédiatement plantée. La flétrissure a été estimée en comptant les plantes flétries juste avant le défanage. La nécrose vasculaire au talon a été relevée par échantillonage des tubercules récoltés.

RESULTATS: Les fongicides systémiques EASOUT et MERTECT ont controlé la maladie de façon supérieure aux autres fongicides. Tous les traitements ont permis d'obtenir des rendements supérieurs au témoin.

Traitements et doses d'emploi par 100 kg de semences	Rendement kg/10 m de rang	% de plantes flétries	% de nécrose vasculaire au talon
EASOUT 10%, 500 g	73.9 a	1.00	13.2
Témoin non-inoculé	73.8 a	0.00	11.3
TUBERSEAL, 16%	67.3 a	14.00	63.3
MERTECT F 45%, 13.3 m. + 200 ml eau sur tubercules entiers	66.9 a	0.00	13.6
CGA 449, 500 g	63.7 a	17.00	72.1
Témoin inoculé	48.9 b	100.00	73.2

Diseases of Cereal and Forage Crops

Maladies des céréales et cultures fourragères

Edited by / Révisé par
R.A. Martin; W. H. Johnston

CROP: Barley, cv. Galt

PEST: Common root rot, Cochliobolus sativus and Fusarium spp.

TITLE: SEED TREATMENT EVALUATION FOR COMMON ROOT ROT CONTROL IN GALT BARLEY, 1987.

MATERIALS: EL 228 (5% nuarimol); HWG 1608 (2.5% unknown, FS); PP 450 (1.25% flutriafol); UBI 2100-2 (23% carbathiin); UBI 2446 (22% carbathiin + 2% imazalil); UBI 2454 (10% RH3866); UBI 2466 (6% BAYTAN + 20% THIRAM).

METHODS: Galt barley was seed treated at the rates given in the table below. The seed was planted May 7, 26, and 12 at Lacombe, Olds, and Vegreville, respectively.

Approximately 1100 seeds were sown in 4 row plots, 5 m long and replicated 4 times in a randomized complete block design. Emergence was counted in 2-1 m segments of the 2 centre rows. Common root rot was rated as the percent of moderately and severely diseased subcrown internodes of 25 plants examined. (Based on the method of Ledingham et al., Can. Plant Dis. Surv. 53:113-122) Yield was the weight of grain harvested from the two centre rows.

NAME AND AGENCY:
ORR, D.D., Agriculture Canada, Bag Service 5000, Lacombe, Alberta T0C 1S0

SLOPEK, S., Regional Crops Lab, Box 10, Olds, Alberta T0M 1P0

KHARBANDA, P.D., Alberta Environmental Centre, Bag 4000, Vegreville, Alberta T0B 4L0

RESULTS: The data are summarized in the table below.

CONCLUSIONS: There were no significant differences in emergence at any location, indicating a lack of phytotoxicity in the chemicals tested. Only Lacombe and Vegreville showed significant differences in common root rot ratings. The following three treatments showed significantly less disease than check at both sites:

UBI 2100-2 plus EL-228
HWG 1608 plus EL-228 and
PP 450 plus EL-228

Unfortunately there was not a consistent yield increase to correspond with disease control. At Olds there were no significant differences in root rot ratings and there were no significant increases in yield.

Treatment	Rate (gai/kg)	Emergence (/m)			Common Root Rot (% Diseased)			Yield (kg/ha)		
		Lacombe	Olds	Veg*	Lacombe	Olds	Veg	Lacombe	Olds	Veg
UBI 2100-2	.55	30	24	31	67 ab	41	58 ab	5546	4070 c	4076
UBI 2446	.6	31	23	30	56 abc	43	53 abc	5744	4474 bc	4351
UBI 2454	.2	30	21	31	45 bc	33	45 abcd	5704	4521 bc	4402
UBI 2466	.65	33	22	26	63 abc	60	53 abc	5837	4788 bc	4384
HWG 1608	.03	28	26	32	67 ab	50	62 a	5501	4836 bc	4128
HWG 1608	.02	33	25	25	56 abc	46	58 ab	5624	4941 bc	4286
EL 228	.15	28	25	22	41 c	73	47 abcd	5760	5298 abc	4666
UBI 2466 + EL 228	.5 + .1	28	24	31	45 bc	59	45 abcd	5657	4162 c	4381
UBI 2100-2 + EL 228	.55 + .15	27	26	28	39 c	69	40 bcd	5552	6394 a	4467
HWG 1608 + EL 228	.02 + .15	28	26	28	46 bc	54	30 d	5817	4670 bc	4268
PP 450	.05	29	23	30	50 abc	58	63 a	5953	4641 bc	4148
PP 450 + EL 228	.05 + .15	31	26	30	46 bc	52	36 cd	5518	5107 bc	4501
CHECK	--	35	24	30	72 a	49	61 a	5644	5627 ab	4355

Column means followed by the same letter do not differ significantly according to Duncan's Multiple Range Test (P = .05).

* Veg = Vegreville.

CROP: Barley var. Argyle

PEST: Covered smut, Ustilago hordei (Pers.) Lagerh

TITLE: EVALUATION OF FUNGICIDES APPLIED AS SEED TREATMENTS FOR CONTROL OF COVERED SMUT IN BARLEY, 1987

MATERIALS: TF 3752 (12.5 g/L flutriafol flowable), TF 3673 (2.5% flutriafol dry), TF 3753 (50 g/L flutriafol flowable), TF 3656 (75 g/L triadimenol liquid), TF 3480 (75 g/L triadimenol flowable), TF 3760 (1.25% flutriafol, 18.5% lindane dry), TF 3759 (12.5 g/L flutriafol, 185 g/L lindane flowable), AGROX Fl. (300 g/L maneb flowable), VITAFLO 280 (14.9% carbathiin, 13.2% thiram flowable).

METHODS: Seed samples were treated in jars and mixed on a roller for 15 minutes April 23. The trial was seeded May 1 with a single row cone seeder. Plots consisted of single rows, each 4 meters long with 200 seeds per row. Treatments were replicated 4 times in a randomized block design. Untreated guard rows were placed on both sides of each block. Numbers of seedings emerged were counted and plots were assessed for vigor and covered smut infection.
Location: Burlington, Ontario

NAME AND AGENCY:

SMITH, D.B.
Chipman, A Business Unit of C-I-L Inc.
400 Jones Road
Stoney Creek, Ontario
L8G 3Z1

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Emergence was not significantly affected by any treatment. Vigor ratings were similar for all treatments with no indication of phytotoxicity with any treatment. Covered smut was controlled by all seed treatments with 100% control provided by all treatments except TF 3752 and TF 3673 at 0.025 g ai/kg seed.

TREATMENT	RATE[1]	EMERGENCE[2]		VIGOR[3]	COVERED SMUT INFECTION[4]
		May 11	May 19	May 19	JULY 13
TF 3752	0.025 g	70.5 a*	72.1 a	6.8	0.34 a (94)[5]
TF 3752	0.050 g	70.8 a	74.3 a	7.0	0.00 a (100)
TF 3752	0.100 g	79.8 a	77.6 a	7.1	0.00 a (100)
TF 3673	0.025 g	65.3 a	78.6 a	6.9	0.19 a (97)
TF 3673	0.050 g	66.7 a	70.7 a	7.1	0.00 a (100)
TF 3673	0.100 g	73.3 a	71.9 a	7.0	0.00 a (100)
TF 3753	0.100 g	66.9 a	82.0 a	7.1	0.00 a (100)
TF 3753	0.200 g	68.7 a	75.5 a	7.1	0.00 a (100)
TF 3656	0.150 g	75.9 a	76.2 a	7.1	0.00 a (100)
TF 3656	0.300 g	67.7 a	67.5 a	7.1	0.00 a (100)
TF 3480	0.150 g	68.6 a	76.4 a	7.0	0.00 a (100)
TF 3480	0.300 g	69.5 a	76.7 a	7.1	0.00 a (100)
TF 3760	0.025 g	70.9 a	75.2 a	7.3	0.00 a (100)
TF 3760	0.050 g	69.7 a	77.2 a	7.3	0.00 a (100)
TF 3759	0.025 g	72.7 a	72.3 a	7.0	0.00 a (100)
TF 3759	0.050 g	65.1 a	78.1 a	7.0	0.00 a (100)
AGROX Fl.	1.020 g	66.4 a	74.1 a	7.4	0.00 a (100)
VITAFLO 280	0.490 g + 0.440 g	63.2 a	75.9 a	7.4	0.00 a (100)
Check		67.2 a	69.8 a	7.1	6.01 b -

1. Active ingredient per kg of seed (fungicide component only).
2. Average percent emergence (200 seeds per plot).
3. Vigor rating (1 = very poor, 10 = excellent).
4. Average number of smutted heads observed per plot. (Data has been square root transformed for analysis).
5. Percent control relative to numbers in the check plots.

* Treatment means in the same column followed by the same letter are not significantly different at the 5% level (t-test).

CROP: Barley va. Galt

PEST: Loose smut, Ustilago nuda

TITLE: SEED TREATMENT EVALUATION FOR LOOSE SMUT CONTROL IN BARLEY.

MATERIALS: BAYTAN 30 FS (30 g/L triadimenol), HWG 1608 25 FS (25 g/L ethyltrianol), VITAVAX SOLUTION (230 g/L carbathiin).

METHODS: Naturally infested seed was treated and seeded at Red Deer on May 9. Treatments were seeded in single rows 6 m long with a single row v-belt seeder. The treatments were replicated 4 times in a randomized complete block. Numbers of diseased heads were counted from the middle 5 m of each row. Emergence counts were from 1 meter in each row.

NAME AND AGENCY:
EYOLFSON, A.K.
Chemagro Limited
2381 Ness Avenue
Winnipeg, Manitoba
R3J 1A5

RESULTS: The results are summarized in the table below.

CONCLUSIONS: HWG 1608 at 2.0 gm/100 kg of seed and BAYTAN gave effective control of loose smut in barley. VITAVAX and HWG 1608 at the low rate provided fair control of loose smut.

TREATMENT	RATE (g ai/100 kg seed)	EMERGENCE May 29	% HEADS INFESTED % of Control
Control		50 a*	100 c
HWG 1608 25 FS	1.0	47 a	30 b
HWG 1608 25 FS	2.0	44 a	4 a
HWG 1608 25 FS	3.0	48 a	3 a
BAYTAN 30 FS	15.0	43 a	1 a
VITAVAX 230 g/L	56.0	52 a	42 b

* Values followed by the same letter are not significantly different at the 5% level (Duncan's Multiple Range Test).

CROP: Barley var. Galt

PEST: Loose smut, Ustilago nuda

TITLE: SEED TREATMENT EVALUATION FOR LOOSE SMUT CONTROL IN BARLEY.

MATERIALS: BAYTAN 30 FS (30 g/L triadimenol), HWG 1608 25 FS (25 g/L ethyltrianol), VITAVAX SOLUTION (230 g/L carbathiin).

METHODS: Naturally infested seed was treated and seeded at Portage la Prairie on April 28. Treatments were seeded in single rows 6 m long replicated 4 times with a cone seeder. Loose smut was counted as infected heads in the middle 5 m of each row on July 8.

NAME AND AGENCY:
GIBB, W.B. and RUSSELL, R.C.
Chemagro Limited
2381 Ness Avenue
Winnipeg, Manitoba
R3J 1A5

RESULTS: The results are summarized in the table below.

CONCLUSIONS: HWG 1608 and BAYTAN gave effective control of loose smut with BAYTAN giving total control. The 2.0 and 3.0 g ai/100 kg rates of HWG 1608 also gave near perfect control.

TREATMENT	RATE (g ai/100 kg seed)	% HEADS INFESTED % of Control	NUMBER OF DISEASED HEADS AVERAGE PER 5 M ROW, 4 REPS.
Control		100 d*	53 d
HWG 1608 25 FS	1.0	15 b	8 b
HWG 1608 25 FS	2.0	9 b	5 b
HWG 1608 25 FS	3.0	4 a	.25 a
BAYTAN 30 FS	15.0	0 a	0 a
VITAVAX 230 g/L	56.0	30 c	16 c

* Values followed by the same letter are not significantly different at the 5% level (Duncan's Multiple Range Test).

CROP: Barley, cv. York

PEST: Loose smut, Ustilago nuda

TITLE: FUNGICIDE SEED TREATMENT CONTROL OF BARLEY LOOSE SMUT AT TWO LOCATIONS, 1987.

MATERIALS: HWG 1608 (ethyltrianol 25 g/L), TF3752 (flutriafol 25 g/kg), TF3752 (flutriafol 12.5 g/L), RH7592 (60 g/L), VITAFLO 280 (carbathiin 166 g/L, thiram 147 g/L), ANCHOR (carbathiin 66 g/L, thiram 66 g/L), UBI 2454 (myclobutanil 100 g/L), BAYTAN 30 (triadimenol), UBI2467 (carbathiin 220 g/L, thiram 200 g/L), UBI2393-2 (carbathiin 220 g/L, TBZ 24 g/L), SPOTLESS (diniconazole 25 g/kg), SDS45037 (mepronil 75 g/kg).

METHODS: Barley seed was treated, at the University of Guelph, using the above materials at the rates listed in the table below. Seed was sown at Elora, Ontario, in plots 4 rows wide by 3 m long on 05/24/87 and at Charlottetown, Prince Edward Island, in plots 4 rows wide by 4.8 m long on 05/14/87. Each treatment was replicated four times in a complete randomized block design. Prior to tillering emergence counts were taken on two metres of row per plot. When heading was complete loose smut was determined. At Elora the number of smutted heads and total number of heads in one row of each plot was determined. If less than 5 smutted heads were counted then the total number of smutted heads per plot were determined. At Charlottetown the total number of smutted heads per plot and the total head count in one row per plot were determined.

RESULTS: There were no significant differences in emergence at either location.

CONCLUSIONS: Loose smut levels were higher at Elora than Charlottetown. The differences in levels, where seed lot was the same, maybe an indication of differences in environmental impact on smut expression, or a reflection of a higher emergence of infected seeds at Elora.

There were some similarities in disease control between locations. VITAFLO 280 and ANCHOR were equally effective at both locations while disease control from the other carbathiin containing materials (UBI2467 and UBI2393-2) was greater at Charlottetown. Although statistically similar to other materials the carbathiin based compounds in general provided one of the highest levels of smut control at both locations, as did flutriafol (TF3673 and TF3752).

HWG 1608 and BAYTAN were relatively effective at both locations, although BAYTAN had a lower level of control at Elora (55.4% vs. 90.5%). SDS-45037 and, to an extent SPOTLESS, were not as effective as the other materials. The widest variations between locations occurred with RH7592, UBI2454, and SDS-45037. At Elora SDS-45037 disease control averaged 39.2% while at Charlottetown it was only 9.6%. RH7592 averaged 54.9% at Elora but only 34.2% at Charlottetown.

Differences between locations in disease control may have been in part a reflection of temperature differences during the early growing season and the effect on uptake and efficacy of some of the test materials.

NAME AND AGENCY:
MARTIN, R.A. and L.V. EDGINGTON
Agriculture Canada, Research Station
Charlottetown, Prince Edward Island C1A 7M8
and
Dept. of Environmental Biology
University of Guelph
Guelph, Ontario N1G 2W1

TREATMENT	RATE (g a.i./kg seed)	ELORA SMUT (%)	ELORA CONTROL (%)	CHARLOTTETOWN SMUT (%)	CHARLOTTETOWN CONTROL (%)
HWG 1608	0.01	6.1 abcd*	65.1	1.9 abcd	81.9
HWG 1608	0.02	2.5 abc	85.7	0.6 a	94.3
HWG 1608	0.03	3.0 abc	82.8	3.6 d	65.7
TF3673	0.05	2.5 abc	85.7	0.1 a	99.1
TF3752	0.05	3.3 abc	81.1	0.0 a	100.0
RH7592	0.05	7.4 abcd	57.8	9.7 fgh	7.6
RH7592	0.10	8.5 cdef	51.4	8.5 fg	19.0
RH7592	0.30	7.8 abcde	55.4	2.5 c	76.2
VITAFLO 280	0.93	1.4 a	92.0	0.2 ab	98.1
ANCHOR	1.00	1.7 ab	90.3	0.3 ab	97.1
UBI2454	0.1	7.8 abcde	55.4	1.4 abcd	86.7
UBI2454	0.15	11.5 def	34.3	1.1 abcd	89.5
UBI2454	0.2	5.5 abcd	68.6	0.0 ab	100.0
BAYTAN	0.16	7.8 abcde	55.4	1.0 abc	90.5
UBI2467	1.05	3.9 abc	77.8	0.1 ab	99.0
UBI2393-2	1.10	3.2 abc	81.2	0.2 ab	98.1
SPOTLESS	0.025	4.0 abc	77.2	6.1 e	41.9
SPOTLESS	0.05	9.0 cdef	48.6	2.3 bcd	78.1
SPOTLESS+THIRAM	0.025+0.1	8.3 bcdef	52.6	1.2 abc	88.6
SDS-45037	0.25	11.3 def	35.4	8.9 fg	15.2
SDS-45037	0.50	14.3 efg	18.3	10.3 gh	0.2
SDS-45037	0.75	7.8 abcde	55.4	11.7 h	-11.4
SDS-45037	1.00	8.5 cdef	51.4	8.2 f	21.9
SDS-45037	1.25	11.3 def	35.4	8.2 f	21.9
Untreated Control	0	17.5 g	-	10.5 gh	-

*Values in the same column which are followed by the same letter are not significantly different at a 0.05 level of probability (Duncans Multiple Range Test).

CROP: Barley, cv. Galt

PEST: Loose smut, Ustilago nuda

TITLE: SEED TREATMENT EVALUATION FOR LOOSE SMUT CONTROL IN GALT BARLEY, 1987.

MATERIALS: EL 228 (5% nuarimol); HWG 1608 (2.5% unknown, FS); PP 450 (1.25% flutriafol); UBI 2100-2 (23% carbathiin); UBI 2446 (22% carbathiin + 2% imazalil); UBI 2454 (10% RH3866); UBI 2466 (6% BAYTAN + 20% THIRAM).

METHODS: Galt barley, naturally infested with loose smut (Ustilago nuda), was seed treated at the rates given in the table below. The seed was planted May 7, 26, 26 and 12 at Lacombe, Olds, Beaverlodge and Vegreville, respectively.

Approximately 1100 seeds were sown in 4 row plots 5 m long and replicated 4 times in a randomized complete block design. Emergence was counted in 2-1 m segments of the 2 centre rows at Lacombe and Olds. Loose smut was counted as infected heads per 2 centre rows.

NAME AND AGENCY:
ORR, D.D., Agriculture Canada, Bag Service 5000, Lacombe, Alberta T0C 1S0

SLOPEK, S., Regional Crops Lab, Box 10, Olds, Alberta T0M 1P0

DAVIDSON, J.G.N., Agriculture Canada, Box 29, Beaverlodge, Alberta T0H 0C0

KHARBANDA, P.D., Alberta Environmental Centre, Bag 4000, Vegreville, Alberta T0B 4L0

RESULTS: There were no significances in emergence at Lacombe or Olds. The smut results are outlined in the table below.

CONCLUSIONS: All chemicals and combinations tested had significantly less smut at all locations than the untreated check. The most effective treatments at all locations were a combination of PP450 plus EL 228, UBI 2454, and a mixture of UBI 2466 plus EL 228, resulting in an average mean over all locations of 2-3 infected heads per area counted.

Treatment	Rate (g ai/kg)	Smut (Count per 2 centre rows)			
		Lacombe	Olds	Beaverlodge	Vegreville
UBI 2100-2	.55	36 b	21 bc	18 b	32 b
UBI 2446	.6	33 bc	10 de	7 cd	17 c
UBI 2454	.2	5 g	4 e	1 d	3 d
UBI 2466	.65	18 def	5 de	2 d	8 cd
HWG 1608	.03	14 efg	14 cde	4 cd	18 c
HWG 1608	.02	22 cde	15 bcd	10 c	20 c
EL 228	.15	27 bcd	24 b	9 c	18 c
UBI 2466 + EL 228	.5 + .1	4 g	4 e	0 d	3 d
UBI 2100-2 + EL 228	.55 + .15	11 efg	6 de	4 cd	5 d
HWG 1608 + EL 228	.02 + .15	6 g	4 de	1 d	4 d
PP 450	.05	7 fg	5 de	0 d	2 d
PP 450 + EL 228	.05 + .15	4 g	4 e	0 d	2 d
CHECK	--	88 a	54 a	30 a	62 a

Column means followed by the same letter do not differ significantly according to Duncan's Multiple Range Test (P = .05).

CROP: Barley var. York

PEST: Loose smut, Ustilago nuda

TITLE: EVALUATION OF FUNGICIDES APPLIED AS SEED TREATMENTS FOR CONTROL OF LOOSE SMUT IN BARLEY, 1987

NAME AND AGENCY:

SMITH, D.B.
Chipman, A Business Unit of C-I-L Inc.
400 Jones Road
Stoney Creek, Ontario
L8G 3Z1

MATERIALS: TF 3752 (12.5 g/L flutriafol flowable), TF 3673 (2.5% flutriafol dry), TF 3753 (50 g/L flutriafol flowable), TF 3656 (75 g/L triadimenol liquid), TF 3480 (75 g/L triadimenol flowable), AGROX Fl. (300 g/L maneb flowable), VITAFLO 280 (14.9% carbathiin, 13.2% thiram flowable).

METHODS: Seed samples were treated in jars and mixed on a roller for 15 minutes April 23. The trial was seeded April 30 with a single row cone seeder. Plots consisted of single rows, each 4 meters long with 200 seeds per row. Treatments were replicated 4 times in a randomized block design. Untreated guard rows were placed on both sides of each block. Numbers of seedings emerged were counted and plots were assessed for vigor and loose smut infection.
Location: Burlington, Ontario

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Emergence was low with all treatments and no significant differences were observed. All treatments except VITAFLO 280 and TF 3752 at 0.1 g ai/kg seed had vigor ratings equal to or slightly higher than the check. All treatments except AGROX Fl. and TF 3752 at 0.025 g ai/kg seed provided significant control of loose smut. All flutriafol formulations at 0.1 g ai/kg and triadimenol at 0.3 g ai/kg provided 100% control of loose smut. All treatments except TF 3752 at 0.025 and 0.05 g ai/kg, TF 3673 at 0.025 g ai/kg and AGROX Fl. were statistically equivalent to the standard VITAFLO 280 treatment.

TREATMENT	RATE[1]	EMERGENCE[2]		VIGOR[3]	LOOSE SMUT[4]		
		May 11	May 18	May 18	June 25	June 29	
TF 3752	0.025 g	44.2 a*	48.7 a	6.5	6.7 c	8.5 ef	(38)[5]
TF 3752	0.050 g	39.6 a	47.7 a	6.9	1.9 b	2.8 cd	(80)
TF 3752	0.100 g	42.0 a	49.4 a	6.4	0.0 a	0.0 a	(100)
TF 3673	0.025 g	39.9 a	55.4 a	6.9	1.7 b	3.7 de	(73)
TF 3673	0.050 g	45.8 a	52.4 a	7.0	1.8 b	2.2 bcd	(84)
TF 3673	0.100 g	40.6 a	45.1 a	6.8	0.0 a	0.0 a	(100)
TF 3753	0.100 g	43.2 a	46.1 a	6.6	0.0 a	0.0 a	(100)
TF 3753	0.200 g	43.5 a	47.3 a	7.0	0.2 ab	0.3 abc	(98)
TF 3656	0.150 g	48.4 a	49.7 a	6.6	0.0 a	0.3 abc	(98)
TF 3656	0.300 g	42.1 a	49.4 a	6.5	0.0 a	0.0 a	(100)
TF 3480	0.150 g	41.4 a	53.6 a	7.0	0.5 ab	0.5 abc	(96)
TF 3480	0.300 g	37.9 a	49.8 a	7.1	0.2 ab	0.0 a	(100)
AGROX Fl.	1.020 g	41.4 a	48.9 a	6.9	12.3 d	10.9 f	(20)
VITAFLO 280	0.49 + 0.44 g	44.3 a	55.1 a	6.4	0.2 ab	0.2 ab	(99)
Check		44.0 a	49.8 a	6.5	10.7 cd	13.7 f	-

1. Active ingredient per kg of seed.
2. Average percent emergence (200 seeds per plot).
3. Vigor rating (1 = very poor, 10 = excellent).
4. Average number of smutted heads per plot (data has been square root transformed for analysis).
5. Percent control relative to numbers in the check plots.

* Treatment means in the same column followed by the same letter are not significantly different at the 5% level (t-test).

CROP: Barley cv. York

PEST: Loose smut, Ustilago nuda (Jensen) Rostr.

TITLE: EVALUATION OF SEED TREATMENT FUNGICIDES FOR CONTROL OF LOOSE SMUT IN BARLEY, 1987

MATERIALS: TF 3752 (flutriafol 12.5 g/L), TF 3673 (flutriafol 2.5%), TF 3753 (flutriafol 50 g/L), TF 3656 (triadimenol 75 g/L), TF 3480 (triadimenol 75 g/L), AGROX FL (maneb 300 g/L), VITAFLO 280 (carbathiin 14.9%, thiram 13.2%).

METHODS: Seed was treated in jars and mixed on a roller for 15 minutes. Plots of 200 seeds were planted in 6 m rows on May 8 with a cone-type seeder. Treatments were replicated 4 times in a completely randomized block design with untreated guard rows on both sides of each block. Emergence counts were conducted and plots were assessed for loose smut infection.
Location: Rosser, Manitoba.

NAME AND AGENCY:

MOONS, B.
Chipman, A Business Unit of C-I-L Inc.
86-1313 Border Street
Winnipeg, Manitoba
R3H 0X4

RESULTS: The results are summarized in the table below.

CONCLUSIONS: There were no statistical differences in crop emergence counts or heads per metre row counts. All treatments except for AGROX FL, TF 3752 at 0.025 and 0.050 grams ai/kg seed, and TF 3673 at 0.025 grams ai/kg seed provided good control of loose smut.

TREATMENT	RATE g ai/kg of seed	MEAN/EMERGENCE PER ROW June 3	MEAN INFECTED HEADS/ROW July 15	MEAN HEADS PER METRE ROW July 15
TF 3752	0.025	126.5 a[1]	3.0 d	40.0 a
TF 3752	0.050	145.0 a	2.0 cd	40.5 a
TF 3752	0.100	136.0 a	0.0 a	34.3 a
TF 3673	0.025	124.3 a	1.5 bcd	38.8 a
TF 3673	0.050	138.8 a	1.0 abc	43.3 a
TF 3673	0.100	129.0 a	0.0 a	37.5 a
TF 3753	0.100	144.0 a	0.0 a	39.3 a
TF 3753	0.200	122.3 a	0.0 a	40.8 a
TF 3656	0.150	139.3 a	0.5 ab	39.5 a
TF 3656	0.300	112.3 a	0.0 a	39.5 a
TF 3480	0.150	136.8 a	0.0 a	40.8 a
TF 3480	0.300	117.0 a	0.0 a	43.0 a
AGROX FL	1.000	123.3 a	9.0 e	38.8 a
VITAFLO 280	0.49 + 0.44	136.3 a	0.0 a	40.8 a
Check	-	128.1 a	11.5 e	37.8 a

1. Treatment means in the same column followed by the same letter are not significantly different at the 5% level.

CROP: Barley cv. York

PEST: Loose smut, Ustilago nuda (Jensen) (Rostr.)

TITLE: SEED TREATMENT FUNGICIDES FOR THE CONTROL OF SEED BORNE LOOSE SMUT IN BARLEY, 1987

MATERIALS: TF 3752 (12.5/L flutriafol flowable), TF 3753 (50 g/L flutriafol flowable), TF 3673 (2.5% flutriafol dry), TF 3656 (75 g/L triadimenol liquid), TF 3480 (75 g/L triadimenol flowable), AGROX FL (300 g/L maneb flowable), VITAFLO 280 (14.9% carbathiin, 13.2% thiram flowable),

NAME AND AGENCY:

PARTYKA, E.F.
Chipman, A Business Unit of C-I-L Inc.
2108C St. George Avenue
Saskatoon, Saskatchewan
S7M 0K7

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All seed treatments significantly reduced the incidence of loose smut in barley. The TF 3656 formulation of triadimenol was less effective than the TF 3480 formulation. Crop emergence was not effected by any of the seed treatments tested.

METHODS: York barley was seeded near Outlook, Saskatchewan into irrigated sand soil at a depth of 3 cm on May 8, 1987 using a tractor mounted precision cone seeder. Plots consisted of 200 seeds each treated with various rates of seed treatment as indicated in the table below. Experimental design was a randomized complete block with 4 replicates. Plots were 1 row of 200 seeds and each row was 6m long and spaced 30cm apart. There were 2 control treatments and results from both treatments were combined for ANOVA. The untreated control in the table below reports the results from the 2 control plots combined.
Location: Outlook, Saskatchewan

Treatment	Rate (g ai/kg seed)	BARLEY PLANT COUNT		INFECTED HEAD COUNT/LOOSE SMUT PER PLOT
		GS 11	GS 21-23	
TF 3572	0.025	44.5 a	83.5 a	3.3 a
TF 3572	0.050	39.8 a	87.5 a	0.5 a
TF 3572	0.100	40.3 a	75.0 a	0.0 a
TF 3673	0.025	49.8 a	81.0 a	2.3 a
TF 3673	0.050	42.8 a	86.0 a	0.8 a
TF 3673	0.100	40.3 a	87.3 a	0.0 a
TF 3753	0.100	40.3 a	85.5 a	0.2 a
TF 3753	0.200	40.0 a	81.8 a	0.0 a
TF 3656	0.150	44.5 a	90.8 a	3.2 ab
TF 3656	0.300	48.8 a	92.8 a	4.6 ab
TF 3480	0.300	42.8 a	86.3 a	0.2 a
AGROX FL	1.000	36.5 a	86.5 a	7.8 b
VITAFLO 280	0.49 + 0.44	39.0 a	86.5 a	7.8 b
Untreated	-	39.7 a	89.1 a	18.5 c

1. Treatment means in the same column followed by the same letter are not significantly different at the 5% level (t-test).

CROP: Barley cv. Harrington

PEST: Net blotch, Pyrenophora teres

TITLE: CONTROL OF NET BLOTCH OF BARLEY WITH FOLIAR FUNGICIDES AND ITS INFLUENCE ON GRAIN YIELD.

MATERIALS: Bayleton WP (triadimefon, 50%); HWG 1608 EC (ethyltrianol, 1.2%); Tilt EC (propioconazole, 25%); Sportak EC (prochloraz 40%).

METHODS: Barley seed, cv. Harrington, was planted on May 12, in 4 row plots, 6m x 1.2m, replicated 4 times in a randomized complete block. Plants were inoculated with actively growing Pyrenophora teres by spraying macerated mycelial and conidial suspension twice, once 10 days before and again 3 days after fungicides were sprayed. All inoculations were done late in the evening. The crop was lightly irrigated periodically to promote good plant growth and disease development. Two liters of each of the freshly prepared fungicide-suspensions was sprayed equally on 4 plots (replications) with a Knapsack sprayer on July 7. The disease severity was estimated on a scale of 0-9 on August 14, ZGS 85; top two leaves of 10 randomly chosen tillers from the inner two rows in each plot were evaluated, and the average disease severity calculated. To determine yield, 5 meter sections of the inner two rows, discounting 0.5 m sections from each end of the plot, were straight combined on September 10. Thousand-kernel weights were also taken.

NAME AND AGENCY:
KHARBANDA, P.D.
TURNBULL, G.
Alberta Environmental Centre
Bag 4000
Vegreville, Alberta T0B 4L0

RESULTS: The disease development was good and uniform throughout the plots. Results are summarized in the table below.

CONCLUSIONS: HWG-1608 (125g ai/ha), Sportak + LC 477 (surfactant), and Tilt significantly controlled the disease compared with check. HWG-1608, applied at a lower rate, 62.5g ai/ha was not very effective. Sportak treatment significantly improved yield, whereas HWG-1608 (125g ai/ha) significantly improved the 1000-kernel weight compared with untreated check.

	TREATMENT	RATE (g ai/ha)	MEAN* DISEASE INCIDENCE	MEAN* 1000-KERNEL WEIGHT (g)	MEAN* YIELD (g)
1.	HWG-1608 1.2 EC	62.5	5.4 ab	38.91 ab	1381.1 ab
2.	HWG-1608 1.2 EC	125	3.9 c	40.35 a	1394.4 ab
3.	BAYLETON 50 WP	125	5.7 ab	38.35 b	1452.6 ab
4.	TILT 25 EC	125	4.5 bc	39.80 ab	1287.6 b
5.	SPORTAK 40 EC + LC 477 (surfactant)	400+ 250 ml/ha	3.2 c	39.02 ab	1532.8 a
6.	CONTROL		6.5 a	38.21 b	1293.0 b

* Mean of 4 replications. Column means followed by the same letter do not differ significantly according to Duncan's Multiple Range Test.

CROP: Barley, cv. Birka

PEST: Net blotch, Pyrenophora teres

TITLE: INFLUENCE OF FOLIAR FUNGICIDES ON NET BLOTCH AND YIELD RESPONSE IN BARLEY, 1987.

MATERIALS: Tilt (propiconazole 250EC), Bayleton (triadimenol 50WP), HWG 1608 (foliar 1.2EC), RH7592 (60 g/l), Dithane M45 (mancozeb 80WP), Spotless (XE-779 25WP), Easout (thiophanate methyl, 10D).

METHODS: Barley plots were established on 5/20/87 at a seeding rate of 300 viable seeds per m^2. Each plot was 8 rows wide by 4.5 m, with 17.8 cm between rows and separated by two rows of wheat. Treatments were replicated four times in a complete randomized block design. At Zadoks Growth Stage (ZGS) 45 the materials above were applied, at the rates listed in the table below, using a CO_2 backpack sprayer. At ZGS 81 the 2nd and 3rd leaves on ten randomly selected tillers were rated for net blotch using the Horsfall-Barratt Rating System. Yield and thousand kernel weight were determined from the harvest of the centre six rows of each plot.

NAME AND AGENCY:
MARTIN, R.A. and F.G. CHEVERIE
Agriculture Canada, Research Station
Charlottetown, Prince Edward Island
C1A 7M8

RESULTS: Results are presented in the table below.

CONCLUSIONS: Spotless and HWG 1608 (187.5 g ai/ha) were the only treatments to have significantly reduced net blotch intensity when compared to both of the two untreated control plots. When treatments were applied net blotch symptoms had yet to develop on all but the lowest of leaves. It was not until late stages of grain filling that significant symptom expression was observed. As such treatment efficacy may have been low due to the time period between application and significant infection.

Low disease pressure during early to mid grain filling phases was probably partially responsible for the lack of significant yield responses. Variability between plots was also a contributing factor.

TREATMENT	RATE (g a.i./ha)	% NET BLOTCH 2nd leaf	% NET BLOTCH 3rd leaf	YIELD (kg/ha)	THOUSAND KERNEL WEIGHT (g)
UNTREATED (No. 1)	0	24.1	78.4	4640	45.4
UNTREATED (No. 2)	0	27.7	75.5	4030	47.0
TILT	125	15.9	66.0	4670	47.3
BAYLETON	125	21.2	76.3	4420	46.7
HWG 1608	125	18.3	66.0	4370	47.0
HWG 1608	187.5	12.5	54.5	4770	47.6
RH7592	60	23.4	71.4	4330	46.6
RH7592	120	14.5	71.9	4690	48.0
DITHANE M45	1800	31.3	83.9	4400	46.7
SPOTLESS	100	8.8	50.6	4370	48.1
EASOUT	700	28.8	81.3	3880	45.2
TILT + EASOUT	125+700	21.3	75.6	4820	46.8
LSD (0.05)*		11.9	18.5	NS*	NS

*NS - Not significant at a 0.05 level of probability.

CROP: Barley, cv. Birka

PEST: Net blotch, Pyrenophora teres

TITLE: INFLUENCE OF FUNGICIDE SEED TREATMENTS ON NET BLOTCH AND YIELD OF BARLEY, 1987

MATERIALS: Vitaflo 280 (carbathiin 166 g/l, thiram 147 g/l), TF3673 (PP450 25 g/kg), TF3752 (PP450 FL 12.5 g/l), Spotless (XE-779 250 g/kg), RH-7592 (60 g/l), HWG1608 (ethyltrianol 25 g/l), TF3656 (triadimenol 75 g/l), and CGA 449 (200 g/kg).

METHODS: Barley seed, cv. Birka was treated with the above listed materials at the rates indicated in the table below using a small batch seed treater. Plots were established on 05/14/87 at a seeding rate of 300 viable seeds per m^2. Each plot was 8 rows wide by 4.5 m, with 17.8 cm between rows. Each treatment plot was separated by two rows of spring wheat. Treatments were replicated in a complete randomized block design. At Zadok's Growth Stage (ZGS) 12 emergence counts were taken on two metres of row per plot. At ca. ZGS 59 net blotch was assessed on the 3rd leaf from the head of ten randomly selected tillers per plot using the Horsfall-Barratt Rating System. Yield and thousand kernel weight were determined from the harvest of the centre 6 rows of each plot using a small plot combine.

NAME AND AGENCY:
MARTIN, R.A.
Agriculture Canada, Research Station
Charlottetown, Prince Edward Island
C1A 7M8

RESULTS: There was insufficient seedling blight in the trial to warrant disease assessment. Results of seed treatment effects on foliar net blotch and yield of barley are presented in the table below.

CONCLUSIONS: The use of fungicide seed treatments had no significant impact on emergence, net blotch, yield or thousand kernel weight in this trial. The 1987 season on P.E.I. was very good relative to disease severity in cereals, with most diseases being lower in severity than generally occurs on barley in P.E.I.. While disease ratings would appear to indicate a severe infection it should be noted that the rating was relatively late in the season, only 20 days prior to harvest, and on a lower leaf. While there was no significant response to treatment, variation was high between plots, all treatments had lower severity ratings and further evaluation would be warranted.

TREATMENT	RATE (g a.i./kg seed)	EMERGENCE (plants/m^2)	NET BLOTCH (%)	YIELD (kg/ha)	1000 KERNEL WEIGHT (g)
UNTREATED	0.0	194	68.8	4940	45.34
VITAFLO 280	0.72	196	63.0	4990	45.68
VITAFLO 280	1.03	158	42.4	4580	47.17
TF3673	0.05	206	53.5	4790	46.42
TF3673	0.10	183	39.5	4440	45.38
TF3752	0.25	209	51.0	5010	47.28
TF3752	0.50	188	49.3	4770	45.68
TF3752	1.00	176	38.7	4580	46.09
SPOTLESS	0.05	195	59.2	4430	44.63
SPOTLESS	0.10	204	57.9	4690	46.44
RH-7592	0.10	190	60.6	4560	45.45
RH-7592	0.30	190	53.1	5030	46.36
HWG1608	0.01	181	53.7	4640	45.61
HWG1608	0.02	167	44.7	4590	47.04
HWG1608	0.03	210	55.4	5040	47.34
TF3656	0.15	195	44.4	4810	46.33
TF3656	0.30	169	40.7	4410	45.42
CGA449	0.2	188	65.2	4610	46.56
CGA449	0.4	190	48.1	4550	46.30
CGA449	0.6	183	58.0	4440	45.80
		NS*	NS	NS	NS

*NS - not significantly different at a 0.05 level of probability.

CROP: Barley, cv. Harrington

PESTS: Net Blotch, *Pyrenophora teres*

TITLE: EFFECT OF FOLIAR APPLIED FUNGICIDES ON NET BLOTCH OF BARLEY

MATERIALS: Polyram DF (metiram 80%)
Dithane M 45 (mancozeb 80%)
Citowett Plus

METHODS: Harrington barley was seeded at 115 kg/ha using a conventional seed drill on May 15, 1987 into a clay loam soil near Olds Alberta. Each treatment was replicated four times in a randomized complete block design. The plot size was 2.5 x 5 m. The treatments were applied on July 1 (ZGS 39) and July 16 (ZGS 45) in 108 L/ha of water at a constant pressure of 276 kPa using a two m CO_2 sprayer operated at a forward speed of 7 km/hr. Diclofop-methyl (0.70 kg/ha) and bromoxynil (0.40 kg/ha) were applied on June 6, 1987 for weed control. On August 15(ZGS 80) the treatments were evaluated by randomly selecting 6 - 10 penultimate leaves from each plot and visually assessing net blotch as percent of leaf area. Other diseases were present but the infestation levels were neglible.

NAME AND AGENCY:
MCINNES, D.
BASF Canada Inc.
10 Constellation Court
Rexdale, Ontario M9W 1K1

RESULTS: The results are summarized in the table below.

CONCLUSIONS: The environmental conditions were not conducive to the occurrence of substantial disease pressure and as a result, the efficacy data is inconclusive. In the absence of significant disease pressure it can be concluded that none of the treatments resulted in a statistically significant yield reduction. All treatments tended to increase yields compared to the untreated check; however, only treatment three was significantly higher (DMR 0.05).

TREATMENT	RATE (kg ai/ha)	% COVER OF PENULTIMATE LEAF NET BLOTCH (87/08/15)	YIELD (kg/ha) (87/10/09)
1. Untreated Check:	-	1.0	5906b
2. Dithane M 45/Dithane M 45	1.8/1.8	0.4	6052ab
3. Polyram DF/Polyram DF	1.8/1.8	0.5	6863a
4. Polyram DF + Citowett Plus/ Polyram DF + Citowett Plus	1.8 + 0.05% 1.8 + 0.05%	0.5	6101ab
5. Polyram DF/Polyram DF	2.2/2.2	1.3	6663ab
6. Polyram DF + Citowett Plus/ Polyram DF + Citowett Plus	2.2 + 0.05% 2.2 + 0.05%	1.5	6058ab

* Duncan's Multiple Range Test at the 5% level

CROP: Barley, c.v. Leduc
, c.v. Harrington

PEST: Net Blotch, Pyrenophora teres
Scald, Rhynchosporium secalis

TITLE: NET BLOTCH AND SCALD CONTROL ON TWO VARIETIES OF BARLEY FROM FOLLAR APPLICATIONS OF TILT.

MATERIALS: TILT (propiconazole, 250 EC).
BAYLETON (triadimenol, 50 WP).

METHODS: At one location in Vimy, Alberta, Leduc barley was planted on May 12, 1986 in 17 cm rows, 4 cm depth, at a seeding rate of 92 kg/ha using a hoe drill. A total of 84 kg/ha of actual nitrogen was applied. At the second location in Westlock, Alberta, Harrington barley was planted on May 24, 1986 in 15 cm rows, 4 cm depth, at a seeding rate of 112 kg/ha using a press drill. A total of 111 kg of actual nitrogen was applied to the field. Treatments were applied to both locations using a hand held CO_2 boom sprayer delivering 100 l/ha through 8001 tee-jet flat fan nozzles. All plots were 4 x 8 m in size of which 2 x 8 m were actually sprayed. Treatments were applied at Zadok's growth stage 37 and 45-50. At Vimy, this occurred on June 25 and 28, while at Westlock this occurred on June 30 and July 7. Disease assessments were taken 3 weeks after Zadok's G.S. 45-50. The penultimate leaf of ten randomly chosen tillers per plot, were rated for Net Blotch and Scald intensity using the Horsfall-Barratt system. Yields were taken on September 4 and September 10 at Vimy and Westlock respectively using a Hege small plot combine which harvested an area,of 9.6 m^2.

NAME AND AGENCY:
LABUN, T.J. and J.R. MCNAUGHT
Ciba-Geigy Canada, Ltd.
820-26 Street, N.E.
Calgary, Alberta
T2A 2M4

RESULTS: Disease and yield responses are presented in the table below.

CONCLUSIONS: The predominant diseases were Net Blotch at Vimy and Net Blotch and Scald at Westlock. Disease infestations occurred much heavier and earlier at the Westlock site. TILT significantly controlled disease when compared to the check when applied at either Zadok's G.S. 37 or 45-50 at both locations. Yield was positively influenced by an application of TILT at either G.S. 37 or 45-50 at the Westlock site, but only by an application at G.S. 45-50 at the Vimy site. This may have been due to a much earlier than required application at G.S. 37 at this site particularly, since disease occurred much later (after G.S. 45-50) (Vimy).

TREATMENT AND RATE (g ai/ha)		TIMING (Zadok's)	PERCENT DISEASE Vimy 19/07	PERCENT DISEASE Westlock 28/07	YIELD (kg/ha) Vimy	YIELD (kg/ha) Westlock
Control		-	27.3 a	50.12 a	5598 c	5191 b
TILT	125	37	11.5 bc	7.61 bc	6219 bc	6207 a
TILT	125	45-50	2.9 c	2.57 c	7092 ab	6100 a
BAYLETON	125	45-50	22.3 ab	12.65 b	5931 bc	5363 b

* Values in the same column which are followed by the same letter are not significantly different at a 0.05 level of probability (Duncan's Multiple Range Test).

CROP: Barley, cv. Samson, Johnston

PEST: Scald, Rhynchosporium secalis

TITLE: CONTROL OF SCALD WITH TILT IN AN INTENSIVE BARLEY MANAGEMENT SYSTEM, 1987.

MATERIALS: Tilt (125 g/L propiconazole, EC), Cerone (400 g/L ethephon, SN).

METHODS: Johnston and Samson barley were seeded in 2 separate tests conducted in the thin black soil zone at Richard, SK on May 6/87. Seeding rate was 85 kg/ha and seeding depth was 4 cm. Nitrogen levels indicated in the table below are amounts of N above Saskatchewan Soil Testing Laboratory recommendations. Nitrogen (46-0-0) fertilizer was incorporated in the fall of 1986. Crop row spacing was 15 cm. Experimental design was a RCBD with 4 replications, plot size was 6 m by 3 m. The previous crop was field pea. Yields were taken by combine harvesting a 7.8 m^2 portion of each plot and are reported on a moisture equivalent basis. All chemical treatments were applied on June 19/87, air temperature was 14°C. In those treatments containing both ethephon and propiconazole, the 2 products were tank-mixed. There was no visible sign of any disease on the plants at application.

NAME AND AGENCY:
HOLM, F.A. and E.F. PARTYKA
Crop Science and Plant Ecology
University of Saskatchewan
Saskatoon, Saskatchewan S7N 0W0

The crop stage at application was GS 45-47 for Johnston and GS 44-46 for Samson. All treatments were applied in 112 L/ha of water at 275 kPa using CO_2 propellant. The sprayer was equipped with six 8001SS T-jet nozzles spaced 50 cm apart and set 50 cm above the crop. Disease assessments were done visually.

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Initially, the crop was under considerable moisture stress. However, heavy rains in July and August improved growing conditions. Treatment with Tilt significantly reduced disease infection levels in both varieties of barley. Disease levels were not sufficiently high to cause a significant yield loss.

Nitrogen kg/ha	Propiconazole kgai/ha	Ethephon kgai/ha	% Penultimate leaf infected with scald		Yield g/m^2	
			Johnston	Samson	Johnston	Samson
0	0	0	8.8a[1]	6.3bcd	361	349
0	0	.24	7.5a	7.5bc	327	408
0	.125	0	2.5b	0.0f	303	409
0	.125	.24	2.5b	1.3ef	355	365
50	0	0	6.3a	8.8bc	398	384
50	0	.24	6.3a	7.5bc	324	378
50	.125	0	1.3b	0.0f	291	425
50	.125	.24	0.0b	2.5def	314	358
100	0	0	6.3a	10.0ab	325	383
100	0	.24	6.3a	13.8a	382	417
100	.125	0	1.3b	1.3ef	347	330
100	.125	.24	2.5b	5.0cde	322	383
Date of assessment			12/08	12/08	10/09	10/09
					N.S.F.	N.S.F.

[1] Treatment means in the same column followed by the same letter do not significantly differ at 95% confidence (Protected t-test).

CROP: Barley cv. Rodeo

PEST: Scald, Rhynchosporium secalis, Spot blotch, Cochliobolus sativus

TITLE: CONTROL OF FOLIAR DISEASES IN RODEO BARLEY.

NAME AND AGENCY:
BLYDORP, L.J. and TOLTON, D.A.
Chemagro Limited
256 Britannia Road East
Mississauga, Ontario, L4Z 1S6

MATERIALS: BAYLETON 50 WP (triadimefon), FOLICUR 1.2 EC (144 g ai/L ethyltrianol), TILT 250 EC (propiconazole).

METHODS: Barley was planted on April 11, 1987 in 10 cm rows at a rate of 400 seeds/m^2 with a Wintersteiger small plot cone seeder in a Harriston silt loam soil near Harriston, Ontario. Plots were 1.0 m wide, 6.5 m long and replicated 4 times in a randomized complete block design. A 25 cm bare strip of soil separated each plot. P and K were applied according to soil test. 100 kg N/ha was applied on May 1 followed by 40 kg N/ha at Zadok's Growth Stage (ZGS) 45. The plant growth regulator Cerone (240 g ai/L ethephon) was applied at ZGS 45 at a rate of 0.5 L/ha. Fungicide treatments were applied when scald symptoms first appeared on June 10 at ZGS 41 with a CO_2 powered back pack sprayer delivering 200 L/ha through 8002 teejet flat fan nozzles at 200 kPa to every other plot. Disease was evaluated by assessing the second leaf on July 2 at ZGS 77 and the third leaf on July 9 at ZGS 81 of five plants per plot and visually estimating the percent diseased leaf area. Yields were taken on July 30 using an Almaco small plot combine.

RESULTS: The results are summarized in the table below. All treatments reduced scald and spot blotch symptoms significantly. The high rate of FOLICUR gave significantly better spot blotch control then the two lower rates of BAYLETON. All treatments yielded significantly higher than the check. Thousand kernel weight (1000 kwt) and hectolitre weight was not affected by treatments.

CONCLUSIONS: All foliar fungicide treatments decreased foliar disease levels and increased yield significantly.

TREATMENT	RATE (kg ai/ha)	APPLICATION Date	APPLICATION ZGS	% SCALD 2nd Leaf ZGS 77 7/2	% SPOT BLOTCH 3rd Leaf ZGS 81 7/9	Hectolitre Weight (kg)	1000 kwt (g)	YIELD (t/ha)
CONTROL	-	-	-	3.7 a*	3.8 a	64.3 a	41.0 a	5.45 c
FOLICUR 1.2 EC	.125	5/27	30	0.2 b	1.3 bc	63.9 a	42.8 a	6.49 a
FOLICUR 1.2 EC	.1875	5/27	30	0.0 b	1.0 bc	61.6 a	44.0 a	6.24 ab
FOLICUR 1.2 EC	.250	5/27	30	0.0 b	0.7 c	63.1 a	43.0 a	6.36 ab
BAYLETON 50WP	.125	5/27	30	0.6 b	2.3 b	61.1 a	41.0 a	5.93 b
BAYLETON 50WP	.1875	5/27	30	0.4 b	2.3 b	62.0 a	44.3 a	6.13 ab
BAYLETON 50WP	.250	5/27	30	0.3 b	1.8 bc	61.6 a	40.5 a	6.23 ab
TILT 250 EC	.125	5/27	30	0.0 b	1.8 bc	63.4 a	42.0 a	6.20 ab

* Values in the same column which are followed by the same letter are not significantly different at the P = 0.05 level (Duncan's Multiple Range Test).

CROP: Barley, cv. Harrington

PEST: Scald, Rhynchosporium secalis, and Net Blotch, Pyrenophora teres

TITLE: FOLIAR FUNGICIDES FOR CONTROL OF SCALD AND NET BLOTCH IN BARLEY

MATERIALS: BAYLETON 50WP (triadmefon, 50%)
TILT 250EC (propiconazole, 25%)
DITHANE M-45 80WP (mancozeb, 80%)

METHODS: Harrington barley was seeded near Eagle Hill, Alberta on May 26 into barley stubble using a grain drill. Treatments were randomly assigned to plots 1A-9A. Barley straw was spread on each of the plots at ZGS* 13. An identical series of plots (1B-9B) was established to the North of plots 1A-9A (see plot design below). No straw was added to plots 1B-9B. All plots were 9 X 16 m. A 3 m strip of unsprayed barley separated plots within each series and 4 m separated the A- and B-series of plots. Before ZGS 40, fungicides were applied using a compressed air, bicycle wheel sprayer with a 3 m boom, 6 8002 Teejet nozzles spaced 50 cm apart delivering 200 L/ha at a spray pressure of 275 kPa. At ZGS 50, fungicide was applied with a Solo backpack sprayer at a spray pressure of between 200-300 kPa. Percent diseased leaf areas of the flag through the flag-3 (4th leaf below the head) were assessed several times during the season on 15 randomly selected plants per plot, using the Horsfall-Barratt Rating System. Six randomly selected samples of $1m^2$ were hand harvested per plot. Each sample was handled separately and provided estimates of plot yield and kg/hL weight. The moisture content of each sample was determined immediately after weighing using a Labtronics Model 919 Moisture Meter. All yields and kg/hL weights were adjusted to a standard moisture content of 14.8%. Since treatments were not replicated in a randomized design only adjacent treatments should be compared.

NAME AND AGENCY:
SLOPEK, S.W.
Alberta Agriculture
Olds, Alberta
T0M 1P0

RESULTS: The results of this study are summarized in the table below. The amount of leaf damage in the B-series plots was generally higher than the A-series at all sampling dates. The amount of leaf damage caused by net blotch was quite consistent across all plots at a level of 1% on flag-3 at ZGS 45 and 3% on flag-1 at ZGS 71. The level of scald varied across treatments. At ZGS 85 the ratio of net blotch to scald was approximately 1:1 on flag-1 for plots 4A/4B, whereas plots 7A/7B and 8A/8B were almost exclusively scald.

CONCLUSIONS: Both BAYLETON and TILT when applied at ZGS 33 provided much better disease control than the adjacent treatments. In both plot series the ZGS 33 application of BAYLETON and TILT consistently produced higher yields than adjacent treatments, with the TILT outyielding the adjacent check plots by 36% and 43%. DITHANE M-45 applied at ZGS 13+33 outyielded the check by 15% in the A-series plots and the ZGS 13 application of TILT by 1%. However, in the B-series the ZGS 13 application of TILT outyielded the ZGS 13+33 application of DITHANE M-45 by 6%. Similar reversals occurred in plots 1 and 2. It is suspected that the high yields in plots 1B and 2B may have been due to a possible double application of fertilizer. The experimental design which was used precludes making definitive comparisons between treatments. However, the data may be used in conjunction with other experimental data in the development of crop loss or fungicide efficacy models using regresson analyses.

Plot Design

9B	8B	7B	6B	5B	4B	3B	2B	1B
9A	8A	7A	6A	5A	4A	3A	2A	1A

PLOT NO.	TREATMENTS	RATE (kg ai/ha)	TIMING ZGS*	PERCENT AREA DISEASED July 16 ZGS 45 Flag-3	Aug. 7 ZGS 71 Flag-2	Aug. 25 ZGS 85 Flag-1	YIELD MEAN (kg/ha)	TEST WEIGHT MEAN (kg/hL)
1A	DITHANE M-45	1.800	33+51[1]	3.6	70.7	-	5085	54.2
2A	BAYLETON	.200	13	3.3	72.1	-	4850	51.8
3A	BAYLETON	.200	51	3.2	64.7	-	5563	56.3
4A	BAYLETON	.200	33	1.5	29.1	84.9	5937	56.1
5A	TILT	.125	13	4.7	61.0	-	5481	52.8
6A	DITHANE M-45	1.800	13+33	2.1	83.2	-	5547	53.2
7A	CHECK	-	-	3.8	72.6	89.6	4837	51.0
8A	TILT	.125	33	1.5	5.9	55.3	6562	60.9
9A	DITHANE M-45	1.800	50	4.0	63.2	-	5654	59.1
1B	DITHANE M-45	1.800	33+51	3.4	80.6	-	6358	58.8
2B	BAYLETON	.200	13	3.0	98.3	-	6430	58.1
3B	BAYLETON	.200	51	3.7	96.1	-	5472	53.5
4B	BAYLETON	.200	33	2.6	27.9	81.2	6400	54.7
5B	TILT	.125	13	5.4	100.0	-	5346	54.9
6B	DITHANE M-45	1.800	13+33	3.5	100.0	-	5060	54.8
7B	CHECK	-	-	5.5	100.0	98.5	4920	53.7
8B	TILT	.125	33	3.4	29.0	77.3	7018	58.5
9B	DITHANE M-45	1.800	51	6.6	100.0	-	5632	58.1

1 ZGS 13 - June 12, ZGS 33 - July 7, ZGS 51 - July 28
* ZGS - Zadok's Growth Stage

CROP: Barley, cv. Empress, Samson

PEST: Scald, Rhynchosporium secalis, and Net Blotch, Pyrenophora teres

TITLE: FOLIAR FUNGICIDES FOR DISEASE CONTROL IN BARLEY

MATERIALS: BAYLETON 50WP (triadimefon, 50%)
TILT 250EC (propiconazole, 25%)
DITHANE M-45 80WP (mancozeb, 80%)

METHODS: Samson was sown on May 13 and Empress was sown on May 23 near Bowden, Alberta. All plots were sown into barley stubble using a grain drill. Treatments were randomly assigned to plots (see plot designs below). Plots measured 9 X 16 m with a 3 m strip of unsprayed barley between plots. Before ZGS* 40, fungicides were applied with a compressed air bicycle wheel sprayed with a 3m boom, with 6 8002 Teejet nozzles spaced 50 cm pressure apart delivering 200 L/ha at a spray pressure of 275 kPa. After ZGS 40, treatments were applied with a Solo backpack sprayer at a spray pressure of between 200-300 kPa. Percent diseased leaf areas of the flag through the flag-3 (4th leaf below the head) were assessed several times during the season, on 15 randomly selected plants per plot, using the Horsfall-Barratt Rating System. Plot yield and kg/hL weights were determined from six randomly selected hand harvested $1m^2$ areas per plot. The moisture content of each sample was determined immediately after weighing using a Labtronics Model 919 Moisture Meter. All yields and kg/hL weights were adjusted to a moisture content of 14.8%. Since plots were not replicated, only adjacent plots should be compared.

NAME AND AGENCY:
SLOPEK, S.W.
Alberta Agriculture
Olds, Alberta
T0M 1P0

RESULTS: The results are summarized in the tables below. In the Empress check plots the ratio between scald and net blotch was approximately 1:1 at ZGS 45. At ZGS 71 the diseased leaf area in plot 2 was almost exclusively due to net blotch whereas in plot 6 approximately 80% of the leaf damage was due to scald. Leaf damage to the Samson was exclusively due to scald.

CONCLUSIONS: In the Samson, despite approximately 25% less disease on the flag leaves of the BAYLETON treatment, yields were lower than for the check plot. In the Empress, TILT applied at ZGS 30 provided better disease control than adjacent treatments. TILT applied at ZGS 13 outyielded the adjacent check plot by 10% despite similar disease levels. The ZGS 30 application of BAYLETON provided better disease control and 20% higher yields than the adjacent check plot. The ZGS 30+47 application of DITHANE M-45 did not provide better disease control than all adjacent treatments but outyielded adjacent treatments by 5-7%. The experimental design which was used precludes making definitive comparisons between treatments. However, the data may be used in conjunction with other experimental data in the development of crop loss or fungicide efficacy models using regression analyses.

cv. Empress

1	2	3
4	5	6
7	8	9

Plot Design

PLOT NO.	TREATMENTS	RATE (kg ai/ha)	TIMING ZGS*	PERCENT AREA DISEASED July 21 ZGS 45 Flag-3	Aug. 13 ZGS 73 Flag-2	Aug. 13 ZGS 73 Flag-1	YIELD MEAN (kg/ha)	TEST WEIGHT MEAN (kg/hL)
1	BAYLETON	.200	13[1]	2.8	21.2	3.0	5709	60.7
2	TILT	.125	13	1.6	26.2	11.6	5818	61.4
3	CHECK	-	-	5.1	36.0	5.7	5048	59.8
4	DITHANE M-45	.900	47	5.7	25.4	5.6	5340	61.5
5	BAYLETON	.200	30	2.0	31.5	4.0	5582	61.7
6	CHECK	-	-	3.0	42.6	11.7	4640	61.3
7	TILT	.090	30	0.7	13.4	2.6	5472	54.5
8	DITHANE	1.800	30+47	4.7	20.5	3.3	5990	63.9
9	DITHANE	1.800	13+30	4.0	39.2	9.5	5498	60.5

cv. Samson

1	2	3

Plot Design

PLOT NO.	TREATMENTS	RATE (kg ai/ha)	TIMING ZGS*	PERCENT AREA DISEASED Aug. 1 ZGS 69 Flag-1	Aug. 14 ZGS 73 Flag-1	Aug. 14 ZGS Flag	YIELD MEAN (kg/ha)	TEST WEIGHT MEAN (kg/hL)
1	DITHANE M-45	1.800	69[2]	-	94.6	91.4	5769	60.9
2	CHECK	-	-	71.7	99.4	87.5	6664	60.1
3	BAYLETON	.200	69	-	95.0	65.8	6345	64.3

1 ZGS 13 - June 20, ZGS 30 - July 7, ZGS 47 - July 30
2 ZGS 69 - August 1
* ZGS - Zadok's Growth Stage

CROP: Barley, cv. Leduc

PEST: Septoria Leaf Blotch, Septoria spp.
Scald, Rhynchosporium secalis
Net Blotch, Pyrenophora teres

TITLE: FOLIAR FUNGICIDES FOR DISEASE CONTROL IN LEDUC BARLEY

MATERIALS: BAYLETON 50WP (triadimefon, 50%)
TILT 250EC (propiconazole, 25%)
DITHANE M-45 80WP (mancozeb, 80%)

METHODS: Seed was sown May 5 into barley stubble using a grain drill. Treatments were randomly assigned to plots (see plot design below). Plots measured 9 X 16 m with 3 m unsprayed barley between plots. Before ZGS* 40, fungicides were applied with a compressed air bicycle wheel sprayer with a 3 m boom, with 6 8002 Teejet nozzles spaced 50 cm apart delivering 200 L/ha at a spray pressure of 275 kPa. After ZGS 40 treatments were applied with a Solo backpack sprayer at a spray pressure of between 200-300 kPa. Percent diseased leaf areas of the flag through the flag-3 (4th leaf below the head) were assessed several times during the season, on 15 randomly selected plants per plot, using the Horsfall-Barratt Rating System. Plot yield and kg/hL weights were determined from four randomly selected hand harvested 2 X 2 m areas per plot. The moisture content of each sample was determined immediately after weighing using a Labtronics Model 919 Moisture Meter. All yields and kg/hL weights were adjusted to a moisture content of 14.8%. Since treatments were not replicated, only adjacent plots should be compared.

NAME AND AGENCY:
SLOPEK, S.W.
Alberta Agriculture
Olds, Alberta
T0M 1P0

RESULTS: The results of the study are summarized in the table below. At ZGS 45, Scald was the primary pathogen. Net blotch and possibly Septoria leaf blotch were also present. At ZGS 81 scald, levels had not increased, and the primary pathogen was Septoria leaf blotch along with some net blotch.

CONCLUSIONS: Both TILT treatments and the ZGS 45 application of BAYLETON provided good disease control on the flag-1 leaf at ZGS 81. TILT at ZGS 45 also provided good control on the flag-2 at ZGS 81. Despite higher disease levels in the DITHANE ZGS 15+45 and ZGS 45+59 treated plots than in the adjacent check plot, the respective yields were 8% and 11% higher than for the check plot. The ZGS 45 application of BAYLETON produced a 9% yield increase over the check. The ZGS 15/23 application of BAYLETON outyielded adjacent treatments by between 4 to 14%. Overall, disease levels did not appear to be related to yields. Leduc is rated to have intermediate resistance to scald and net blotch and susceptible to Septoria. Host resistance appeared to keep scald levels from increasing despite favourable weather conditions. In adjoining fields planted to scald susceptible varieties, high levels of scald were found with little or no Septoria present. The experimental design which was used precludes making definitive comparisons between treatments. However, the data may be used in conjunction with other experimental data in the development of crop loss or fungicide efficacy models using regression analyses.

Location: Olds

cv. Leduc

Plot Design

1	2	3
4	5	6
7	8	9

PLOT NO.	TREATMENTS	RATE (kg ai/ha)	TIMING ZGS*	PERCENT AREA DISEASED July 11 ZGS 45 Flag-3	Aug. 7 ZGS 81 Flag-2	Aug. 7 ZGS 81 Flag-1	YIELD MEAN (kg/ha)	TEST WEIGHT MEAN (kg/hL)
1	TILT	.125	45[1]	0.6	3.4	2.6	6797	66.2
2	DITHANE M-45	.900	59	0.7	16.5	12.8	6820	62.8
3	BAYLETON	.200	45	0.3	13.8	4.3	6653	68.3
4	BAYLETON	.200	59	0.7	14.1	11.1	6249	55.9
5	DITHANE M-45	2.540	15+45	0.4	34.0	18.3	6613	62.9
6	CHECK	-	-	0.3	28.2	16.3	6105	57.1
7	TILT	.125	15/23	1.8	14.1	2.9	6177	60.4
8	BAYLETON	.200	15/23	0.0	21.4	10.7	7118	66.5
9	DITHANE M-45	1.800	45+59	0.0	51.5	22.8	6801	62.1

1 ZGS 15/23 - June 11, ZGS 45 - July 11, ZGS 59 - July 30
* ZGS - Zadok's Growth Stage

CROP: Barley, cv. Argyle

PEST: Septoria leaf spot, Septoria passerinii
Leaf rust, Puccinia hordei
Net Blotch, Pyrenophora teres

TITLE: EVALYATION OF SPOTLESS FOR CONTROL OF LEAF DISEASES IN BARLEY.

MATERIALS: SPOTLESS (25%) WP, DITHANE M-45 (mancozeb 80%) WP, ASSIST oil concentrate.

NAME AND AGENCY:
WARKENTIN, T.D. and WRIGHT, E.B.
ICMS (Integrated Crop Management Services), Inc.
P.O. Box 1351
Portage la Prairie, Manitoba R1N 3N9

METHODS: Argyle barley was seeded on May 29/87 at a rate of 157 kg/ha at Portage la Prairie, MB. Seed was placed to a depth of 4 cm in rows 19 cm apart using a Morris MH-310 hoe-press drill. Fertilizer was applied with the seed (28-26-0, 202 kg/ha) and topdressed on June 17/87 (34-0-0, 283 kg/ha). Plots were 3x7 m in size and were replicated 4 times in a randomized complete block design. Treatments were applied with a hand-held boom in a volume of 114 l/ha and a pressure of 275 kPa on July 3 (treatments 1 and 2) and July 13 (treatments 3-9 and 1-2 (second application). Barley was at Zadok's stage 37 on July 3 and 55 on July 13. Disease assessments were made on August 4 by randomly selecting 5 flag and 5 penultimate (2nd) leaves per plot and visually rating them for percent leaf area covered by Septoria leaf spot (Sept.), net blotch (NB), and leaf rust (LR). Flag and 2nd leaves were given a single assessment on August 13 for these three diseases combined. Assessments were adjusted using the Horsfall-Barratt scale. Yields were determined by harvesting the center 1.14 m of the plots using a Wintersteiger plot combine.

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All treatments significantly reduced the level of Septoria leaf spot, net blotch, and leaf rust on the flag and penultimate leaves. Treatments containing SPOTLESS tended to reduce the levels of these three diseases to a greater extent than DITHANE M-45 alone, both on the August 4 and August 13 assessment dates. All treatments significantly increased thousand kernel weights and barley yield. Significant increases in disease control or yield using SPOTLESS did not occur with double applications, the addition of ASSIST oil concentrate or DITHANE M-45, or using the 0.12 vs. the 0.06 kg ai/ha rate.

Treatment	Rate (kg ai/ha)	% Diseased Leaf Area: Flag leaf Sept.	Flag leaf NB	Flag leaf LR	2nd leaf Sept.	2nd leaf NB	2nd leaf LR	1000 kwt (g)	Yield (g/m^2)
1. SPOTLESS + ASSIST	0.06[1]	6.0 b[2]	2.5 bc	0.0 c	2.3 c	2.5 c	0.0 c	27.9 b	621 a
2. SPOTLESS + ASSIST	0.12[1]	4.8 b	2.0 c	0.3 c	2.5 c	2.0 c	0.0 c	28.1 b	616 a
3. SPOTLESS + ASSIST	0.06	6.3 b	3.0 bc	0.3 c	2.3 c	2.0 c	0.0 c	28.7 ab	590 a
4. SFOTLESS + ASSIST	0.12	3.3 b	2.0 c	0.0 c	3.0 c	2.5 c	0.0 c	28.9 ab	606 a
5. SPOTLESS	0.06	6.0 b	3.3 bc	0.3 c	3.3 c	3.0 c	0.0 c	30.7 a	636 a
6. SPOTLESS	0.12	6.3 b	2.8 b	0.0 c	2.5 c	2.3 c	0.3 c	27.5 b	617 a
7. SPOTLESS + DITHANE M-45	0.06 2.25	4.5 b	3.0 bc	0.3 c	4.5 c	3.5 c	0.3 c	29.0 ab	602 a
8. SPOTLESS + DITHANE M-45	0.12 2.25	3.5 b	2.3 c	0.0 c	2.5 c	2.5 c	0.3 c	29.3 ab	638 a
9. DITHANE M-45	2.25	11.3 b	3.8 b	3.0 b	14.8 b	7.3 b	4.0 b	28.8 ab	607 a
10. Check	-	46.8 a	5.8 a	11.0 a	57.0 a	9.8 a	12.3 a	25.1 c	528 b

[1] Two applications (see above).

[2] Values within a column followed by the same letter are not significantly different at the 5% level (Duncan's Multiple Range Test).

CROP: Barley cv. Leger

PEST: Spot blotch, Cochliobolus sativus

TITLE: CONTROL OF FOLIAR DISEASES IN LEGER BARLEY.

NAME AND AGENCY:
BLYDORP, L.J., DENTZ, C.B. and TOLTON, D.A.
Chemagro Limited
256 Britannia Road East
Mississauga, Ontario, L4Z 1S6

MATERIALS: BAYLETON 50 WP (triadimefon), FOLICUR 1.2 EC (144 g ai/L ethyltrianol), TILT 250 EC (propiconazole).

METHODS: Barley was planted on April 11, 1987 in 10 cm rows at a rate of 400 seeds/m^2 with a Wintersteiger small plot cone seeder in a Harriston silt loam soil near Harriston, Ontario. Plots were 1.0 m wide, 6.5 m long and replicated 4 times in a randomized complete block design. A 25 cm bare strip of soil separated each plot. P and K were applied according to soil test recommendations. 100 kg N/ha was applied on May 1 followed by 40 kg N/ha at Zadok's Growth Stage (ZGS) 45. The plant growth regulator Cerone (240 g ai/L ethephon) was applied at ZGS 45 at a rate of 0.5 L/ha. Fungicide treatments were applied when spot blotch symptoms first appeared on May 27 at ZGS 30 with a CO_2 powered back pack sprayer delivering 200 L/ha through 8002 teejet flat fan nozzles at 200 kPa to every other plot. Disease was evaluated by assessing the penultimate leaf on July 13 at ZGS 82 of five plants per plot and visually estimating the percent diseased leaf area. Yields were taken on July 30 using a Almaco small plot combine.

RESULTS: The results are summarized in the table below. All treatments significantly reduced spot blotch on the penultimate leaf. The FOLICUR treatments gave the best control followed by BAYLETON and then TILT but there was no significant differences among treatments. All treatments except the low rate of FOLICUR increased yield over the check but not significantly. Hectolitre weight and thousand kernel weight (1000 kwt) are also presented.

CONCLUSIONS: All foliar fungicide treatments reduced foliar disease levels significantly.

TREATMENT	RATE (kg ai/ha)	APPLICATION Date	APPLICATION ZGS	% SPOT BLOTCH Penultimate Leaf 7/9; ZGS 82	Hectolitre Weight (kg)	1000 kwt (g)	YIELD (t/ha)
Control	-	-	-	12.0 a*	65.4 a	41.3 bc	5.85 a
Folicur 1.2 EC	.125	5/27	30	4.4 b	65.0 a	41.0 c	5.83 a
Folicur 1.2 EC	.1875	5/27	30	4.7 b	65.5 a	43.5 a	6.08 a
Folicur 1/2 EC	.250	5/27	30	3.9 b	65.4 a	42.8 ab	6.29 a
Bayleton 50WP	.125	5/27	30	5.8 b	65.9 a	42.0 abc	6.40 a
Bayleton 50WP	.1875	5/27	30	4.9 b	64.9 a	42.3 abc	6.22 a
Bayleton 50WP	.250	5/27	30	5.5 b	65.2 a	43.3 a	6.28 a
Tilt 250 EC	.125	5/27	30	6.6 b	66.2 a	41.5 bc	6.23 a

* Values in the same column which are followed by the same letter are not significantly different at the P = 0.05 level (Duncan's Multiple Range Test).

CROP: Spring barley, cv. Argyle, Harrington

PEST: Naturally occurring foliar diseases

TITLE: EFFECT OF SEED TREATMENT FUNGICIDES ON EMERGENCE, PERCENT FOLIAR DISEASE AND YIELD ON IRRIGATED SPRING BARLEY

MATERIALS: AGROX FLOWABLE (maneb 250 g/L), Chipman; UBI 2100-2 (carbathiin 230 g/L), Uniroyal; UBI 2155 (carbathiin 26.7% and thiram 38.8%),Uniroyal; UBI 2454 (systane 100 g/L), Uniroyal; TF 3656 (triadimenol 75 g/L), Chipman; TF 3752 (flutriafol 12.5 g/L), Chipman.

METHODS: The experiment was done at the Irrigation Development Center, Outlook, Saskatchewan. Fertilizer was broadcast in the spring at 100 Kg/ha of 34-0-0. Irrigation water was applied during the growing season when tensiometer readings measured -0.5 bars. A split plot design was used with the main plots being the barley cultivars Argyle and Harrington while the subplots consisted of the various fungicide treatments and a control. Treatments were replicated four times. The fungicides were applied by first distributing the chemical on the inside surface of a 0.5 L glass jar, then adding 250 g of seed and finally, shaking for several minutes. Each plot consisted of four 6 m rows with 350 seeds planted per row. Seeding and fertilizing (40 kg/ha of 11-55-0) occurred on May 25. Emergence was recorded on June 14 in 2 m of the two center rows. Foliar disease ratings based on the Horsfall-Barrett scale were done on August 7 (early dough stage) by rating 10 randomly chosen penultimate leaves from the two center rows. Harvesting of 4 rows by 5 m long was done on September 15 with yield recorded as grams per plot.

NAME AND AGENCY:
KINDRACHUK, C.R., DUCZEK, L.J. and DZIADYK, D.A.
Research Station, Agriculture Canada
107 Science Crescent
Saskatoon, Saskatchewan
S7N 0X2
(This study was supported by the Saskatchewan Agriculture Development Fund, and the assistance by personnel at the Saskatchewan Irrigation Development Center, is gratefully acknowledged.)

RESULTS: The results are summarized in the table below. The cultivars did not differ significantly in emergence (Argyle - 208, Harrington - 196) or foliar disease (Argyle - 49, Harrington - 35) but they differed significantly (P=0.05) for yield (Argyle - 1870, Harrington - 1624). The cultivar by treatment interaction was not significant so the data for cultivars was combined in the table. Determination of the causal agents of the foliar disease have yet to be done.

CONCLUSIONS: UBI 2454 significantly (P=0.01) reduced emergence from that of the control. There was no significant difference (P=0.01) between treatments for percent foliar disease and yield. Although not significant, the control had the lowest disease and only UBI 2100-2 had a greater yield than the control. UBI 2100-2 also had the highest emergence of all the treatments.

Treatment and Rate (g a.i./kg seed)		Emergence	Foliar Disease (%)	Yield (g)
Control		213 ab*	38 a	1802 a
Agrox Flowable	0.85	220 ab	41 a	1785 a
UBI 2100-2	0.55	223 a	45 a	1838 a
UBI 2155	0.53 + 0.78	214 ab	47 a	1664 a
UBI 2454	0.2	171 c	44 a	1720 a
TF 3656	0.2	192 abc	41 a	1685 a
TF 3752	0.05	195 abc	41 a	1752 a
TF 3752	0.10	186 bc	40 a	1727 a

* Values in the same column which are not followed by the same letter are significantly different at the 0.01 level of probability according to Duncan's Multiple Range Test.

CROP: Spring barley cv. Argyle, Harrington

PEST: Naturally occurring foliar diseases

TITLE: EFFECT OF FOLIAR FUNGICIDE TREATMENTS ON FOLIAR DISEASE AND YIELD OF IRRIGATED SPRING BARLEY.

MATERIALS: TILT (propiconazole EC 250 g/L), Ciba Geigy; DITHANE M45 (mancozeb 80% WP), Rohm and Haas; BAYLETON (triadimefon 50% WP), Chemagro; HWG 1608 (EC 15%), Chemagro; SPORTAK (prochloraz EC 400 g/L), Elanco; BRAVO 500 (chlorothalonil 500 g/L), Biotech; POLYRAN DF (metiram 80% WP), BASF.

METHODS: The experiment was done at the Irrigation Development Center, Outlook, Saskatchewan. In the spring 34-0-0 was broadcast at a rate of 100 kg/ha and during the growing season, irrigation water was applied when tensiometer readings measured -0.5 bars. The treatments were replicated four times in a split plot design with the main plots being the cultivars and the subplots the treatments. Each subplot consisted of eight rows 6 m long and each row contained 350 seeds. Four rows of wheat were planted between subplots. Seeding and fertilizing (40 kg/ha of 11-55-0) occurred on May 25. Fungicides were applied to the foliage of the 8 subplot rows with a hand-held, CO_2 pressurized, 4 nozzle boom sprayer (nozzle size 0.01) delivering 225 L/ha at 250 kPa. The rates applied are shown in the table except for Sportak where 250 ml/ha of Enhance was also added. Spraying occurred on June 26 (tillering stage), July 7 (booting to flag leaf emerged) and July 15 (inflorescence 3/4 to fully emerged). Foliar disease ratings based on the Horsfall-Barrett scale were done on August 5 (early dough) by rating 10 randomly selected penultimate leaves from the two center rows. Harvesting of 5 rows by 5 m long was done on September 17 and 22 with yield recorded as grams per plot.

NAME AND AGENCY:
KINDRACHUK, C.R., DUCZEK, L.J. and DZIADYK, D.A.
Research Station, Agriculture Canada
107 Science Crescent
Saskatoon, Saskatchewan
S7N 0X2
(This study was supported by the Saskatchewan Agriculture Development Fund, and the assistance by personnel at the Saskatchewan Irrigation Development Center, is gratefully acknowledged.)

RESULTS: The results are summarized in the table. The cultivars differed significantly (P=0.01) in foliar disease (Argyle - 13, Harrington - 41) and in yield (Argyle - 2489, Harrington - 2229). The cultivar by treatment interaction was not significant so the data for cultivars was combined in the table. The causal agents of the foliar disease have yet to be determined.

CONCLUSIONS: The control had the highest foliar disease but the only treatment resulting in a significant (P=0.01) reduction in foliar disease over the control was HWG 1608. The control also had the lowest yield but the only treatment with a significantly (P=0.01) higher yield was 3 sprays of Tilt. The correlation coefficient ($r = -0.710$, $n = 9$) shows a significant negative relationship (P=0.05) between foliar disease and yield. The yield increase over the control for 3 sprays of Tilt was 23% and for Sportak it was 19%.

Treatment and Rate (a.i./ha)		Spray schedule			Foliar Disease (%)	Yield
		June 26	July 7	July 15		
Control		spray	spray	spray	35 a*	2087 b
Tilt - 3 sprays	125 g	spray	spray	spray	24 ab	2559 a
Tilt - 1 spray	125 g	-	spray	-	20 ab	2459 ab
Dithane M45	1.8 kg	-	spray	spray	34 ab	2343 ab
Bayleton	200 g	-	spray	spray	33 ab	2157 ab
HWG 1608	125 g	-	spray	spray	15 b	2441 ab
Sportak	400 g	-	spray	-	20 ab	2481 ab
Bravo 500	1.0 kg	-	spray	spray	31 ab	2224 ab
Polyran DF	1.8 kg	-	spray	spray	31 ab	2451 ab

* Values in the same column which are not followed by the same letter are significantly different at the 0.01 level of probability according to Duncan's Multiple Range Test.

CROP: Wheat var. HY 320

PEST: Common bunt, Tilletia caries

TITLE: EVALUATION OF SEED TREATMENT FUNGICIDES FOR CONTROL OF COMMON BUNT IN WHEAT.

MATERIALS: HWG 1608 25 FS (25 g/L ethyltrianol)
BAYTAN 30 FS (30 g/L triadimenol)
VITAVAX SOLUTION (230 g/L carbathiin).

METHODS: Seed was inoculated in bulk with T. caries at a rate of 5 gm/kg. Infested seed was treated in 750 gm lots at the specified rates (see table) in glass jars. HWG 1608 treatments were diluted with water at a rate of 10 ml/kg seed. Seed was sown on May 9 with a single row v-belt seeder. Treatments were a single row 6 m long replicated 4 times in a randomized complete block. Numbers of diseased heads were counted from the middle 5 m of each row. Emergence counts were from 1 meter in each row.

NAME AND AGENCY:
EYOLFSON, A.K.
Chemagro Limited
2381 Ness Avenue
Winnipeg, Manitoba
R3J 1A5

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All treatments gave effective control of bunt with HWG 1608 at 2.0 and 3.0 g ai/100 kg and BAYTAN giving total control.

TREATMENT	RATE (g ai/100 kg seed)	EMERGENCE May 29	% HEADS INFESTED Aug. 25
Control (Clean Seed)		50 a*	.6 a
Control (Diseased Seed)		50 a	46.4 b
VITAVAX 230 g/L	56.0	54 a	.8 a
HWG 1608 25 FS	1.0	48 a	.8 a
HWG 1608 25 FS	2.0	48 a	0 a
HWG 1608 25 FS	3.0	49 a	0 a
BAYTAN 30 FS	15.0	48 a	0 a

* Values followed by the same letter are not significantly different at the 5% level (Duncan's Multiple Range Test).

CROP: Wheat var. HY 320

PEST: Common bunt, Tilletia caries

TITLE: EVALUATION OF SEED TREATMENTS FOR CONTROL OF BUNT OF SPRING WHEAT.

MATERIALS: HWG 1608 25 FS (25 g/L ethyltrianol), BAYTAN 30 FS (30 g/L triadimenol), VITAVAX SOLUTION (230 g/L carbathiin).

METHODS: Seed was inoculated in bulk with T. caries at a rate of 5 gm/kg. Infested seed was treated in 750 gm lots at the specified rates (see table) in glass jars. HWG 1608 treatments were diluted with water at a rate of 10 ml/kg seed. Seed was sown on May 1 in rows 6 m long replicated 4 times in a randomized complete block. Numbers of diseased heads were counted from the middle 5 m of each row on September 12. Emergence counts are from each row on May 14 at the one leaf stage.

NAME AND AGENCY:
ZIRK, E.B.
Chemagro Limited
2381 Ness Avenue
Winnipeg, Manitoba
R3J 1A5

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All treatments gave effective control of bunt with HWG 1608 at 2.0 and 3.0 g ai/100 kg seed and BAYTAN giving near total control.

TREATMENT	RATE (g ai/100 kg eed)	EMERGENCE May 14	% HEADS INFESTED Sept. 12
Control (Clean Seed)		148 d*	.6 a
Control (Diseased Seed)		136 c	55.1 c
VITAVAX 230 g/L	56.0	154 d	2.4 b
HWG 1608 25 FS	1.0	170 e	1.4 ab
HWG 1608 25 FS	2.0	136 c	.5 a
HWG 1608 25 FS	3.0	130 b	.4 a
BAYTAN 30 FS	15.0	103 a	.2 a

* Values followed by the same letter are not significantly different at the 5% level (Duncan's Multiple Range Test).

CROP: Wheat var. Thatcher

PEST: Leaf rust, Puccinia recondita

TITLE: FOLIAR EVALUATIONS FOR CONTROL OF LEAF RUST OF WHEAT.

MATERIALS: FOLICUR (144 g/L ethyltrianol), FOLICUR 45 DF (ethyltrianol), TILT (230 g/L propiconazole), DITHANE M-45 (mancozeb 80 WP), BAYLETON 50 WP (triadimefon).

METHODS: Thatcher wheat was seeded at Portage la Prairie on June 15 at a rate of 101 kg/ha. Each treatment was replicated 4 times in a randomized complete block and applied on July 24 at Zadok's 55 using a CO_2 powered hand held boom with 11002 nozzles at 212 kPa. Disease control was assessed on August 19 by rating the % leaf area infected on the penultimate leaf of 45 leaves per plot.

NAME AND AGENCY:
GIBB, W.B. and RUSSELL, R.C.
Chemagro Limited
2381 Ness Avenue
Winnipeg, Manitoba
R3J 1A5

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Leaf rust was well controlled by FOLICUR and BAYLETON at all rates with the highest rate tested of FOLICUR giving near total control.

TREATMENT	RATE (kg ai/ha)	% DISEASE SEVERITY August 19
Control		50 e*
TILT 230 g/L	.125	2.63 c
DITHANE M-45	1.8	4.65 d
FOLICUR 144 g/L	.0625	.45 ab
FOLICUR 144 g/L	.094	.24 ab
FOLICUR 144 g/L	.125	.36 ab
FOLICUR 144 g/L	.188	.02 a
FOLICUR 45 DF	.125	.31 ab
BAYLETON 50 WP	.125	1.42 bc

* Values followed by the same letter are not significantly different at the 5% level (Duncan's Multiple Range Test).

CROP: Wheat, cv. HY320

PEST: Leaf rust Puccinia recondita
Tan spot Pyrenophora tritici-repentis
Leaf blotches Septoria spp.

TITLE: CONTROL OF FOLIAR DISEASES IN HY320 WHEAT GROWN AT SIX DENSITIES.

NAME AND AGENCY:
ROURKE, D.R.S. , DOELL, R.J.
Ag-Quest
Independent Agricultural Research Services
Box 144
MINTO, Manitoba ROK 1MO

MATERIALS: TILT (propiconazole 250 g/L EC)
DITHANE M-45 (mancozeb 80% WP)

METHODS: HY320 wheat was seeded near Minto,Manitoba on April 29 at rates 300 and 500 seeds/m2 in combination with row spacings of 11,15, and 23 cm. 60 kg/ha P205 and 30 kg/ha K20 were banded prior to seeding. 80 kg/ha N was broadcast as ammonium nitrate on May 6 and an additional 40 kg/ha was broadcast on June 10. Weeds were controlled with applications of Hoegrass II at 3.75 L/ha and with Estaprop at 1.75 L/ha on June 9. Fungicides were applied using a compressed air bicycle sprayer delivering a volume of 110 L/ha at a pressure of 275 kPa. The initial treatments of Tilt and Dithane were applied June 22 at 25C when the wheat was at Zadoks 55 and there was a trace of tan spot/septoria on the lower leaves. The second application of Dithane was applied June 29 at 15C when the wheat was at Zadoks 65. The second application of Tilt (tmt.4 only) was applied July 13 at 15C when the wheat was at Zadoks 75. Rainfall 1 week after treatment was 15, 8, and 30 mm respectively. Disease levels were assessed July 20 using a 0-9 scale in which 0 is disease-free and 9 is greater than 50% leaf area infected on all leaves. Plots were harvested August 13 and yields were adjusted to 14.5% moisture.

RESULTS: The main fungicide effects are presented in the table below.

CONCLUSIONS: All fungicides were effective in reducing disease levels of both tanspot/septoria and leaf rust, although Tilt appeared more effective than Dithane in controlling leaf rust. Plots treated with Tilt had significantly taller plants than plots treated with Dithane or the untreated check. Dithane tended to reduce heads/m2, but not significantly when compared to the check. Increases in yield due to fungicide applications were minimal due to the early maturity of the crop and the reduction in disease levels, both a result of hot dry weather in May and June. Yields tended to be reduced by application of Dithane and increased by the application of Tilt, but when compared to the untreated check, differences were not significant. Fungicides increased thousand kernal weight in all cases albeit only Tilt treatments were significantly greater than the untreated check.

Table 1. Disease Control in HY320 Wheat

Treatment	Rate kg/ha	Growth Stage	Lf Rust 0-9 a	TS/Sept 0-9	Plant Ht.cm	Heads /m2	Yield kg/ha	Kern.Wt Gm/1000
1. Check			5.7	5.7	52	332	3698	48.0
2. Dithane M-45	1.6	55/65	4.4	4.4	50	307	3244	49.0
3. Tilt	.125	55	4.0	4.2	56	334	4170	50.4
4. 2x Tilt	.125/.125	55/75	3 .2	4.2	53	335	3852	50.5
LSD (.05)					4	27	519	1.3

a Disease rating scale - a modification of Horsfall-Barratt according to Luc Couture.

CROP: Wheat, cv. Katepwa

PEST: Leaf rust Puccinia recondita
Tan spot Pyrenophora tritici-repentis
Leaf blotches Septoria spp.

TITLE: CONTROL OF FOLIAR DISEASES IN KATEPWA WHEAT GROWN AT SIX DENSITIES.

MATERIALS: TILT (propiconazole 250 g/L EC)
DITHANE M-45 (mancozeb 80% WP)

METHODS: Katepwa wheat was seeded near Minto, Manitoba on April 29 at rates of 300 and 500 seeds/m2 in combination with row spacings of 11, 15 and 23 cm. 60 kg/ha P2O5 and 30 kg/ha K2O were banded prior to seeding. 80 kg/ha N was broadcast as ammonium nitrate on May 6 and an additional 40 kg/ha was broadcast June 10. Weeds were controlled with applications of Hoegrass II at 3.75 L/ha on May 2 and Estaprop at 1.75 L/ha on June 9. Fungicides were applied with a compressed air bicycle sprayer delivering a volume of 110 L/ha at a pressure of 275 kPa. Initial treatments of Tilt and Dithane were applied June 22 at 25C when the wheat was at Zadoks 55 and there was a trace of tan spot/septoria on the lower leaves. The second application of Dithane was applied June 29 at 15C when the wheat was at Zadoks 65. The second application of Tilt (tmt.4 only) was applied July 13 at 15C when the wheat was at Zadoks 75. Rainfall 1 week after treatment was 15, 8, and 30 mm respectively. Disease levels were assessed July 20 using a 0-9 scale in which 0 is disease-free and 9 is greater than 50% leaf area infected on all leaves. Plots were harvested August 13 and yields were adjusted to 14.5% moisture.

NAME AND AGENCY:
ROURKE, D.R.S. , DOELL, R.J.
Ag-Quest
Independent Agricultural Research Services
Box 144
MINTO, Manitoba ROK 1MO

RESULTS: Results are summarized in the table below.

CONCLUSIONS: All fungicide treatments reduced levels of both leaf rust and tan spot/septoria with the best control achieved with the Dithane and double Tilt applications. Fungicides significantly reduced plant height. Dithane appeared to lower the number of heads/m2 compared to the other treatments. All fungicide treatments reduced yield significantly with the greatest reduction occurring in Dithane treated plots. Yield reductions may be the result of heat stress suffered by the crop in May and June, both before and during the time of fungicide application. This stress also hastened crop maturity, reducing the spread of disease and its negative effects on crop yield. Fungicides did not affect thousand kernal weight.

Table 1. Disease Control in Katepwa Wheat

Treatment	Rate kg/ha	Growth Stage	Lf Rust 0-9[a]	TS/Sept 0-9	Plant Ht.cm	Heads /m2	Yield kg/ha	Kern.Wt. Gm/1000
1. Check			6.0	6.8	57.5	552	3163	36.1
2. Dithane M-45	1.6	55/65	2.1	3.9	51.7	491	2587	35.7
3. Tilt	.125	55	3.2	4.6	53.5	533	2857	36.0
4. 2x Tilt	.125/.125	55/75	2.1	4.1	52.8	532	2798	35.9
LSD(.05)					3.0	28	233	1.0

a Disease rating scale - a modification of Horsfall-Barratt according to Luc Couture.

CROP: Wheat, cv. Fielder

PEST: Leaf rust Puccinia recondita
Tan spot Pyrenophora tritici-repentis
Leaf blotches Septoria spp.

TITLE: EVALUATION OF LATE APPLICATIONS OF TILT AND DITHANE M-45 FOR BROAD SPECTRUM DISEASE CONTROL IN FIELDER WHEAT.

NAME AND AGENCY:
ROURKE, D.R.S., DOELL, R.J.
Ag-Quest
Independent Agricultural Research Services
Box 144
Minto, Manitoba ROK 1MO

MATERIALS: TILT (propiconazole 250 g/L EC)
DITHANE M-45 (mancozeb 80% WP)
TILT-MANCOZEB FORMULATED MIXTURE (propiconazole 4.2%, mancozeb 50% WP).

METHODS: HY320 wheat was seeded near Minto, Manitoba on April 30, at a rate of 300 seeds/m2 and a row spacing of 19.5 cm. 60 kg/ha of P2O5 and 30 kg/ha K2O were banded with the seed. 80 kg/ha of N were broadcast May 6 as ammonium nitrate. Weeds were controlled with applications of Hoegrass II at 3.5 L/ha on May 26, and Estaprop at 1.75 L/ha on June 9. Fungicides were applied with a compressed air bicycle sprayer delivering a volume of 110 L/ha at a pressure of 275 kPa. Treatments 2,4 and 5 were applied June 22 at 25C when the wheat was at Zadoks 50, and treatment 3 was applied on June 26 at 17C when the wheat was at Zadoks 60. Rainfall 1 week after treatment was 15 mm and 16 mm respectively. There was a trace of tan spot on the lower leaves at the time of spraying. Disease levels were evaluated July 20 using a 0-9 scale in which 0 is disease-free and 9 is greater than 50% leaf area infected on all leaves. Plots were harvested August 20, and grain yields were adjusted to 14.5% moisture.

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All fungicides tested on Fielder wheat showed positive results. July 20 disease ratings showed flag leaves of the untreated check about 10-15% covered with leaf rust and also a similar amount of tan spot/septoria. Flag leaves of treated plots were virtually disease-free, although lower leaves had more disease present. Treated plots had significantly higher thousand kernal weights (TKW) than the untreated check. There were no differences in TKW between treated plots. This was reflected in the greater yields from the treated plots compared to the untreated check plots, though only Tilt at Zadoks 60 and the Tilt-Dithane M-45 tank mix resulted in significantly greater yields.

Table 1. Disease Control with Tilt and Dithane M-45[a]

Treatment	Rate kg/ha	Growth Stage	Lf Rust 0-9[b]	TS/Septoria 0-9	Yield kg/ha	Kern.Wt. Gm/1000
1. Check			6.8a	6.5a	3834b	38.8b
2. Tilt	.125	50	4.8b	4.3b	4337ab	41.4a
3. Tilt	.125	60	4.0b	4.8b	4440a	41.6a
4. Tilt+Dithane	.125+1.5	50	4.0b	4.5b	4383a	41.9a
5. Tilt/Man form.	1.62	50	4.8b	4.8b	4210ab	41.3a

[a] Values in the same column which are followed by the same letter do not differ significantly at the 5% level (Duncan's MRT).

b Disease rating scale - a modification of Horsfall-Barratt according to Luc Couture.

CROP: Wheat, cv. HY320

PEST: Leaf rust Puccinia recondita
Tan spot Pyrenophora tritici-repentis
Leaf blotches Septoria spp.

TITLE: EVALUATION OF LATE APPLICATIONS OF TILT AND DITHANE M-45 FOR BROAD SPECTRUM DISEASE CONTROL IN HY320 WHEAT.

MATERIALS: TILT (propiconazole 250 g/L EC)
DITHANE M-45 (mancozeb 80% WP)
TILT-MANCOZEB FORMULATED MIXTURE (propiconazole 4.2%, mancozeb 50% WP).

METHODS: HY320 wheat was seeded near Minto, Manitoba on April 30, 1987 at a rate of 300 seeds/m2 in 19.5 cm rows. 60 kg/ha P2O5 and 30 kg/ha K2O were banded with the seed. 80 kg/ha of N as ammonium nitrate was broadcast May 6. Weeds were controlled with applications of Hoegrass III at 3.5 L/ha on May 26, and Estaprop ay 1.75 L/ha on June 9. Fungicides were applied with a compressed air bicycle sprayer delivering a volume of 110 L/ha at a pressure of 275 kPa. Treatments 2,4 and 5 were applied June 22 at 25C when the wheat was at Zadoks 50. Treatment 3 was applied June 29 at 17C when the wheat was at Zadoks 60. Rainfall 1 week after treatment was 15 and 16 mm respectively. There was a trace of tan spot on the lower leaves at the time of spraying. Disease levels were evaluated July 20 using a 0-9 scale in which 0 is disease-free and 9 is greater than 50% infection on all leaves. Plots were harvested August 20 and grain yields were adjusted to 14.5% moisture.

NAME AND AGENCY:
ROURKE, D.R.S., DOELL, R.J.
Ag-Quest
Independent Agricultural Research Services
Box 144
MINTO, MANITOBA ROK 1MO

RESULTS: Results are summarized in the table below.

CONCLUSIONS: Fungicides significantly reduced levels of both leaf rust and tan spot/septoria in HY320 wheat. Despite of reduction in disease levels, fungicide application did not result in significant increases in yield. However, the check treatment had the lowest yield. Plots treated with the Tilt/Mancozeb formulation had yields nearly 600 kg/ha over the untreated check. There were no significant differences in thousand kernal weights.

Table 1. Disease Control with Tilt and Dithane M-45[a]

Treatment	Rate kg/ha	Growth Stage	Lf Rust 0-9[b]	TS/Septoria 0-9	Yield kg/ha	Kern.Wt. Gm/1000
1.Check			5.8a	5.8a	4046a	46.3a
2.Tilt	.125	50	3.3b	4.0b	4452a	46.7a
3.Tilt	.125	60	3.5b	3.8b	4358a	48.4a
4.Tilt+Dithane	.125+1.5	50	3.0b	3.8b	4171a	47.8a
5.Tilt/Man form.	1.62	50	3.3b	3.8b	4614a	45.7a

[a] Values in the same column which are followed by the same letter do not differ significantly at the 5% level (Duncan's MRT).

b Disease rating scale - a modification of Horsfall-Barratt according to Luc Couture.

CROP: Wheat, cv. Monopol

PESTS: Leaf rust, Puccinia recondita and septoria leaf blotch, Septoria tritici.

TITLE: EVALUATION OF SYSTEMIC FUNGICIDES FOR CONTROL OF FOLIAR DISEASES IN WINTER WHEAT

MATERIALS: Corbel (fenpropimorph 750 g/L)
Tilt (propiconazole 250 g/L)
BAS 9053 (400 g/L)

METHODS: Following a crop of winter rapeseed, the cultivar Monopol was seeded at 220 kg/ha in 13 cm rows at a depth of 2 cm near Harriston, Ontario on October 20, 1986. Plots were established by mowing out pathways with a lawn mower. The 2 x 6 m plots were replicated four times in a randomized complete block design. Phosphorus and potassium were broadcast at the rate of 60 and 40 kg/ha respectively. Nitrogen was broadcast using a split application to a total of 220 kg/ha. Weeds were controlled with bromoxynil/MCPA 720 g/L at the rate of 0.54 kg ai/ha. The materials listed above were applied at the rate and timing indicated in the table below. Applications were made using a hand held CO_2 sprayer with flat fan nozzles at 280 kPa with 200 L/ha of water.

NAME AND AGENCY:
SCHAAD, M.C.
BASF Canada Inc.
10 Constellation Court
Rexdale, Ontario M9W 1K1

Disease levels were assessed using four random samples per plot at four separate timings. The evaluation of the flag leaf is indicated in the table below. The experiment was harvested on August 5, 1987 using a Hege small plot combine. Grain yields were adjusted to 14.5% moisture and all data was analyzed using Duncan's Multiple Range Test at the 5% level.

RESULTS: The results are summarized in the table below.

CONCLUSIONS: There was no significant difference in disease control assessed at ZGS 82 between double applications and single treatments applied at ZGS 65. All treatments applied at ZGS 65 reduced leaf rust (Puccinia recondita) by 20% with the exception of BAS 9053 which had no apparent activity on leaf rust. All treatments except the high rate of fenpropimorph (early) significantly increased hectolitre weights. There were no significant yield differences.

TREATMENTS	RATES (kg ai/ha)	TIMING Zadok	% Cover of Flag Leaf (87/07/15) ZGS 82 Septoria	Leaf Rust	HLWT (kg)	YIELD (kg/ha) 14.5% Moisture
1. Untreated Check:	-	-	90a	32a	72.4c	4468
2. Fenpropimorph	0.45	33	76ab	24ab	74.0ab	4459
3. Fenpropimorph	0.75	33	82ab	24ab	72.8bc	4729
4. Propiconazole	0.125	33	62bc	37a	74.7a	4746
5. Fenpropimorph + BAS 9053	0.45 + 0.4	33	85ab	28a	74.6a	4756
6. Fenpropimorph + BAS 9053	0.45 + 0.4	65	33de	12bc	75.0a	4564
7. BAS 9053	0.4	65	82ab	36a	74.4a	4541
8. Propiconazole	0.125	65	23de	4c	75.0a	4854
9. Fenpropimorph + BAS 9053/ Fenpropimorph + BAS 9053	0.45 + 0.4/ 0.45 + 0.4	33/65	13e	6c	75.2a	4913
10. Propiconazole/Propiconazole	0.125/0.125	33/65	12e	4c	75.2a	5313
11. Fenpropimorph/Fenpropimorph	0.75/0.75	33/65	40cd	5c	74.4a	4412
12. Fenpropimorph/Fenpropimorph	0.75/0.56	33/65	39cd	9c	74.4a	4993
13. Fenpropimorph	0.75	65	60bc	10bc	74.6a	4615
						N.S.

Values followed by the same letter are not significantly different at the 5% level. (Duncan's Multiple Range Test)

CROP: Wheat, cv. Max

PESTS: Leaf rust, Puccinia recondita Septoria leaf blotch, Septoria tritici.

TITLE: EVALUATION OF SYSTEMIC FUNGICIDES FOR CONTROL OF FOLIAR DISEASES IN SPRING WHEAT

MATERIALS: Corbel (fenpropimorph 750 g/L)
Tilt (propiconazole 250 g/L)
BAS 9053 (400 g/L)

METHODS: Following a crop of soybeans, wheat plots were planted near Harriston, Ontario on April 11, 1987. Using a Wintersteiger plot seeder 400 viable seeds per m^2 were established in 10 cm rows at a depth of 3 cm. Plots were seeded to 1 x 6.5 m and replicated four times in a randomized complete block design. Phosphorus and potassium were broadcast prior to seeding at 18 and 32 kg/ha respectively. Nitrogen was broadcast to a total of 190 kg/ha using a three split program. Weeds were controlled with bromoxynil/MCPA 720 g/L at the rate of 0.54 kg ai/ha. Crop lodging was controlled with chlormequat chloride 0.15 kg ai/ha at Zadoks Growth Stage (ZGS) 30. The materials listed above were applied on June 3 and June 23 at ZGS 32 and 65 respectively. Applications were made using a hand held CO_2 sprayer with flat fan nozzles at 240 kPa with 200 L/ha of water. Disease levels were assessed on the flag leaf on July 20 using four random samples per plot. The experiment was harvested on August 6 using a Hege small plot combine. Grain yields were adjusted to 14.5% moisture and all data was analyzed using Duncan's Multiple Range Test at the 5% level.

NAME AND AGENCY:
SCHAAD, M.C.
BASF Canada Inc.
10 Constellation Court
Rexdale, Ontario M9W 1K1

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Early treatments applied at ZGS 32 significantly reduced the infestation level of Septoria tritici assessed on the flag leaf but did not influence leaf rust Puccinia recondita. There was no significant difference in disease control between double applications and single treatments applied at ZGS 65. All treatments applied at ZGS 65 reduced leaf rust infestation by more than 10% with the exception of BAS 9053 which had no apparent activity on leaf rust. Treatments tended to increase hectolitre weights. There were no significant yield differences.

TREATMENTS	RATES (kg ai/ha)	TIMING Zadok	% Cover of Flag Leaf ZGS 82-85, (July 20, 1987) Septoria	Leaf Rust	HLWT (kg)	YIELD (kg/ha) 14.5% Moisture
1. Untreated Check:	-	-	40a	18ab	69.0d	3286
2. Fenpropimorph	0.45	32	40a	11bc	69.3cd	3366
3. Fenpropimorph	0.75	32	25b	11bc	70.0bcd	3440
4. Propiconazole	0.125	32	22b	20a	70.5abcd	3523
5. Fenpropimorph + BAS 9053	0.45 + 0.4	32	21b	14ab	69.1d	3438
6. Fenpropimorph + BAS 9053	0.45 + 0.4	65	9c	3d	71.5ab	3904
7. BAS 9053	0.4	65	23b	20a	69.8cd	3415
8. Propiconazole	0.125	65	8c	4cd	71.6ab	3793
9. Fenpropimorph + BAS 9053/ Fenpropimorph + BAS 9053	0.45 + 0.4/ 0.45 + 0.4	32/65	7c	2d	70.8abc	3649
10. Propiconazole/Propiconazole	0.125/0.125	32/65	5c	3d	72.0a	3922
11. Fenpropimorph/Fenpropimorph	0.75/0.75	32/65	28b	2d	70.8abc	3507
12. Fenpropimorph/Fenpropimorph	0.75/0.56	32/65	21b	2d	70.4abcd	3631
13. Fenpropimorph	0.75	65	26b	2d	70.2bcd	3556
						N.S.

Values followed by the same letter are not significantly different at the 5% level (Duncan's Multiple Range Test)

CROP: Wheat, cv. Max

PESTS: Leaf rust, Puccinia recondita and septoria leaf blotch Septoria tritici.

TITLE: EVALUATION OF FOLIAR APPLIED FUNGICIDES FOR CONTROL OF FOLIAR DISEASES IN SPRING WHEAT

MATERIALS: Dithane M45 (mancozeb, 80%), Polyram DF (metiram, 80%) maneb 50W

METHODS: Following a crop of soybeans, wheat plots were planted near Harriston, Ontario on April 11, 1987. Using a Wintersteiger plot seeder 400 viable seeds per m^2 were established in 10 cm rows at a depth of 3 cm. Plots were seeded to 1 x 6.5 m and replicated four times in a randomized complete block design. Phosphorus and potassium were broadcast at 18 and 32 kg/ha respectively. Nitrogen was broadcast to a total of 190 kg/ha using a three split program. Weeds were controlled with bromoxynil/MCPA 720 g/L at the rate of 0.54 kg ai/ha. Crop lodging was controlled with chlormequat chloride 0.15 kg ai/ha at Zadoks Growth Stage (ZGS) 30. The materials listed above were applied on June 15 and June 23 at ZGS 41 - 42 to 65 respectively. Applications were made using a hand held CO_2 sprayer with flat fan nozzles at 240 kPa with 200 L/ha of water. Disease levels were assessed on the flag leaf on July 20 using four random samples per plot. The experiment was harvested on August 6 using a Hege small plot combine. Grain yields were adjusted to 14.5% moisture and all data was analyzed using Duncan's Multiple Range Test at the 5 % level.

NAME AND AGENCY:
SCHAAD, M.C.
BASF Canada Inc.
10 Constellation Court
Rexdale, Ontario M9W 1K1

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All products tested significantly reduced infestations of Septoria tritici and leaf rust Puccini recondita. There were no significant differences between individual treatments. Treatments did significantly increase hectolitre weights but did not significantly influence yields.

TREATMENTS	RATES (kg ai/ha)	TIMING Zadoks	% Cover of Flag Leaf ZGS 82-85, (July 20, 1987) Leaf Rust	Septoria	HLWT (kg)	YIELD (kg/ha) 14.5% Moisture
1. Untreated Check:	-	-	14a	35a	69.7b	3665
2. Mancozeb, Mancozeb	1.8, 1.8	41-42, 65	4b	13b	71.9a	3989
3. Metiram, Metiram	1.8, 1.8	41-42, 65	4b	10b	71.8a	3799
4. Maneb, Maneb	1.8, 1.8	41-42, 65	3b	9b	71.5a	4083
5. Metiram, Metiram	1.4, 1.4	41-42, 65	6b	14b	71.8a	3754
6. Metiram, Metiram	2.2, 2.2	41-42, 65	4b	10b	72.1a	4020
						N.S.

Values followed by the same letter are not significantly different at the 5% level (Duncan's Multiple Range Test).

CROP: Wheat, cv. Vernon

PEST: Loose smut, Ustilago tritici

TITLE: INFLUENCE OF FUNGICIDE SEED TREATMENTS ON LOOSE SMUT OF WHEAT - 1985,1986.

NAME AND AGENCY:
MARTIN, R.A.
Agriculture Canada, Research Station
Charlottetown, Prince Edward Island
C1A 7M8

MATERIALS: VITAFLO 280 (carbathiin 166 g/l, thiram 147 g/l), VITAFLO 250 (carbathiin 280 g/l), UBI-2401 (carbathiin 220 g/l, imazalil 20 g/l), UBI-2394 (carbathiin 220 g/l, imazalil 20 g/l, thiabendazole 24 g/l), UBI-2391 (300 g/l), UBI-2392 (carbathiin 200 g/l), UBI-2391 60 g/l), GUS-4700 (thiophanate methyl) 327 g/l), UBI-2383 (triadimenol 317 g/l), UBI-2395 (thiabendazole 240 g/l), UBI-2420 (imazalil 200 g/l), UBI-1196 (carbathiin 195 g/l, thiram 195 g/l).

METHODS: Wheat seed, cultivar Vernon, was treated with the above materials at the rates, and in the combinations listed in the table below. The seed was sown on 05/21/85 and 05/14/86 at a seeding rate of 450 viable seeds/m^2 in plots 8 rows wide, 17.8 cm between rows and 4.5 metres in length. Between each wheat plot was an equal size barley guard plot. Each treatment was replicated four times in a complete randomized block design. At Zadoks growth stage (ZGS) 12, emergence was determined. At ZGS 59 the total number of loose smutted heads per plot was determined. Yield and thousand kernel weight was determined on the harvest of the centre six rows of each plot.

RESULTS: Results on loose smut, yield, and thousand kernel weight are present below. There were no significant differences in emergence between any treatment and the untreated control. Evaluation of septoria leaf blight indicated a lack of significant control from any of the seed treatments.

CONCLUSIONS: Yield and thousand kernel weights were not significantly different from the untreated controls in either year. With the exception of UBI-2395 (thiabendazole) and GUS-4700 (thiophanate methyl) all materials significantly reduced loose smut relative to the control in both test years. UBI-2391 and UBI-2420, when applied as the sole treatment, were not as effective as the remaining materials. In general the most effective treatments were those which contained the systemic fungicide triadimenol (UBI-2383). In 1985 treatments which contained carbathiin were not significantly as effective as those containing triadimenol, however in 1986 they were as effective on a statistical bases.

TREATMENT	RATE (g a.i./kg seed)	LOOSE SMUT (heads/plot) 1985	1986	YIELD (kg/ha) 1985	1986	THOUSAND KERNEL WEIGHT (g) 1985	1986
Control	0	61.8a*	70.0a	4630	4720	32.1ab	32.8
VITAFLO 280	0.58	21.5 d	20.0 c	4810	4450	31.4 b	31.7
VITAFLO 250	0.45	25.0 cd	7.5 c	4940	4910	31.7 b	31.8
UBI-2401	0.66	19.5 d	6.3 c	4690	4510	31.8ab	31.2
UBI-2394	0.66	16.3 de	1.3 c	5210	4670	32.6ab	32.4
UBI-2391	0.15	20.5 de	38.8 b	4980	5300	32.4ab	31.7
UBI-2392	0.65	9.0 ef	2.5 c	4770	5010	32.6ab	32.7
GUS-4700	0.46	34.0 c	58.8a	4760	4340	32.1ab	32.1
VITAFLO 250+GUS-4700	0.45+0.56	22.5 d	10.0 c	4960	4840	32.3ab	32.0
UBI-2383	0.15	0.5 f	1.3 c	4680	5130	31.2 b	31.3
UBI-2383	0.30	1.3 f	0.0 c	4970	4670	31.0 b	32.5
UBI-2395	0.06	54.0ab	65.0a	4770	4540	31.8ab	31.5
UBI-2420	0.05	49.3 b	40.0 b	4820	4780	30.7 b	31.8
UBI-1196	0.98	17.8 de	10.0 c	4920	4900	34.2a	32.2
UBI-2383+UBI-2420	0.15+0.05	1.0 f	0.0 c	4740	5130	32.0ab	32.8
UBI-2383+UBI-2395	0.15+0.06	2.0 f	3.8 c	4910	4980	31.4 b	32.7
UBI-2383+UBI-2395 +UBI-2420	0.15+0.06 +0.05	1.0 f	1.3 c	4790	4690	31.9ab	32.2
UBI-2383+UBI-1196	0.15+0.98	0.3 f	1.3 c	4910	5060	32.4ab	32.8
UBI-2383+VITAFLO 280	0.15+0.38	0.0 f	1.3 c	4810	4820	31.4 b	31.7
Standard Error of Mean		3.52	6.37	NS**	NS	0.75	NS

*Values in the same column which are followed by the same letter are not significantly different at a 0.05 level of probability (Duncans Multiple Range Test).
**NS - not significant.

CROP: Wheat cv. HY320

PEST: Loose smut, Ustilago tritici (Pers. Rostr.

TITLE: SEED TREATMENT FUNGICIDES FOR THE CONTROL OF LOOSE SMUT IN WHEAT, 1987

MATERIALS: TF 3752 (12.5/L flutriafol flowable), TF 3753 (50 g/L flutriafol flowable), TF 3673 (2.5% flutriafol dry), TF 3656 (75 g/L triadimenol liquid), TF 3480 (75 g/L triadimenol flowable), AGROX FL (300 g/L maneb flowable), VITAFLO 280 (14.9% carbathiin, 13.2% thiram flowable), TF 3760 (1.25% flutriafol + lindane dry), TF 3759 (12.5 g/L flutriafol + lindane flowable).

METHODS: HY320 wheat was seeded near Outlook, Saskatchewan into irrigated sand soil at a depth of 3 cm on May 8, 1987 using a tractor mounted precision cone seeder. Plots consisted of 200 seeds each treated with various rates of seed treatment as indicated in the table below. Experimental design was a randomized complete block with 4 replicates. Plots were 1 row of 200 seeds and each row was 6m long and spaced 30cm apart. There were 2 control treatments and results from both treatments were combined for ANOVA. The untreated control in the table below reports the results from the 2 control plots combined.
Location: Outlook, Saskatchewan

NAME AND AGENCY:

PARTYKA, E.F.
Chipman, A Business Unit of C-I-L Inc.
2108C St. George Avenue
Saskatoon, Saskatchewan
S7M 0K7

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All seed treatments significantly reduced the incidence of loose smut in wheat, however, infection levels were too low to determine differences between the various seed treatments. There were no treatment effects on emergence noted.

Treatment	Rate (g ai/kg seed)	WHEAT PLANT COUNT		INFECTED HEAD COUNT/LOOSE SMUT PER PLOT
		GS 11	GS 21-23	
TF 3752	0.025	31.3 a[1]	81.8 a	0.3 a
TF 3752	0.050	31.3 a	71.5 a	0.0 a
TF 3752	0.100	27.3 a	76.0 a	0.0 a
TF 3673	0.025	27.0 a	76.0 a	0.5 a
TF 3673	0.050	37.3 a	70.0 a	0.0 a
TF 3673	0.100	30.0 a	84.8 a	0.0 a
TF 3753	0.100	24.8 a	79.0 a	0.0 a
TF 3753	0.200	29.5 a	80.8 a	0.0 a
TF 3656	0.150	27.8 a	75.8 a	0.3 a
TF 3656	0.300	25.3 a	67.5 a	0.0 a
TF 3480	0.150	25.3 a	77.0 a	0.5 a
TF 3480	0.300	30.0 a	70.8 a	0.0 a
TF 3760	0.025	36.5 a	79.3 a	0.0 a
TF 3760	0.050	39.0 a	78.5 a	0.3 a
TF 3759	0.025	36.5 a	74.8 a	0.0 a
TF 3759	0.050	33.5 a	79.0 a	0.5 a
VITAFLO 280	0.49 + 0.44	36.3 a	82.5 a	0.3 a
AGROX FL	0.450	30.0 a	82.8 a	1.5 a
Untreated	-	37.8 a	79.8 a	5.0 b

1. Treatment means in the same column followed by the same letter are not significantly different at the 5% level (t-test).

CROP: Wheat, cv. Monopol

PESTS: Powdery Mildew, Erysiphe graminis, Leaf rust Puccinia recondita and Septoria leaf blotch, Septoria tritici.

TITLE: EVALUATION OF SYSTEMIC FUNGICIDES FOR CONTROL OF FOLIAR DISEASES IN WINTER WHEAT

MATERIALS: Corbel (fenpropimorph 750 g/L)
Tilt (propiconazole 250 g/L)
BAS 9053 (400 g/L)

METHODS: Following a crop of white beans, the cultivar Monopol was seeded at 176 kg/ha in 18 cm rows at a depth of 3 cm near Teviotdale, Ontario on October 23, 1986. Plots were established by mowing out pathways with a lawn mower. The 2 x 6 m plots were replicated four times in a randomized complete block design. Phosphorus and potassium were each broadcast at the rate of 55 kg/ha. Nitrogen was broadcast using a split application to a total of 187 kg/ha. Weeds were controlled with bromoxynil/MCPA 720 g/L at the rate of 0.54 kg ai/ha. The materials listed above were applied at the rate and timing indicated in the table below. Applications were made using a hand held CO_2 sprayer with flat fan nozzles at 280 kPa with 200 L/ha of water. Disease levels were assessed using four random samples per plot at four separate timings, 2 of which are indicated in the table below. The experiment was harvested on July 31 using a Hege small plot combine. Grain yields were adjusted to 14.5% moisture and all data was analyzed using Duncan's Multiple Range Test at the 5% level.

NAME AND AGENCY:
SCHAAD, M.C.
BASF Canada Inc.
10 Constellation Court
Rexdale, Ontario M9W 1K1

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All treatments reduced infestation of powdery mildew (Erysiphe graminis) assessed at ZGS 75. At this assessment all treatments except fenpropimorph alone reduced Septoria tritici infestation. There were no significant differences in disease control between double applications and single treatments applied at ZGS 65. At the later evaluation propiconazole was the only early treatment which significantly reduced Septoria tritici infestation. None of the early applications had any influence on leaf rust (Puccinia recondita) infestation on the flag leaf. All treatments applied at ZGS 65 significantly reduced Septoria tritici infestation. All treatments reduced leaf rust infestation with the exception of BAS 9053 which had no apparent activity on leaf rust. There were no significant differences in hectolitre weights or yields.

TREATMENTS	RATES (kg ai/ha)	TIMING Zadok	% Cover of 3rd Leaf (87/06/30) ZGS 75 (M)	(S)	% Cover of Flag Leaf (87/07/15) ZGS 80 (S)	(R)	HLWT (kg)	YIELD (kg/ha) 14.5% Moisture
1. Untreated Check:	-	-	16a	79a	41a	11a	75.7	4054
2. Fenpropimorph	0.45	33	4b	50bc	40ab	10a	75.0	3883
3. Fenpropimorph	0.75	33	3b	31cd	27abc	10a	75.1	4307
4. Propiconazole	0.125	33	1b	20d	14cde	12a	74.8	4075
5. Fenpropimorph + BAS 9053	0.45 + 0.4	33	2b	16d	26abcd	12a	75.5	4122
6. Fenpropimorph + BAS 9053	0.45 + 0.4	65	4b	37bcd	8e	4bc	76.0	4052
7. BAS 9053	0.4	65	7b	41bcd	10de	11a	76.0	3992
8. Propiconazole	0.125	65	3b	32cd	4e	2c	76.1	4185
9. Fenpropimorph + BAS 9053/ Fenpropimorph + BAS 9053	0.45 + 0.4/ 0.45 + 0.4	33/65	2b	19d	5e	4bc	76.0	4313
10. Propiconazole/Propiconazole	0.125/0.125	33/65	2b	20d	3e	1c	75.4	4324
11. Fenpropimorph/Fenpropimorph	0.75/0.75	33/65	2b	36bcd	25bcd	4bc	75.8	4133
12. Fenpropimorph/Fenpropimorph	0.75/0.56	33/65	4b	58ab	18cde	4bc	76.2	4238
13. Fenpropimorph	0.75	65	5b	58ab	18cde	6b	76.1	4265
							N.S.	N.S.

(M) - Powdery Mildew (S) - Septoria (R) - Leaf Rust

Values followed by the same letter are not significantly different at the 5% level (Duncan's Multiple Range Test)

CROP: Wheat var. Neepawa

PEST: Powdery mildew, Erysiphe graminis f. sp. tritici

TITLE: EVALUATION OF FUNGICIDES APPLIED AS SEED TREATMENTS FOR CONTROL OF POWDERY MILDEW OF WHEAT, 1986

NAME AND AGENCY:

SMITH, D.B.
Chipman, A Business Unit of C-I-L Inc.
400 Jones Road
Stoney Creek, Ontario
L8G 3Z1

MATERIALS: TF 3480 (75 g/L triadimenol flowable), TF 3656 (75 g/L triadimenol liquid), TF 3673 (2.5% flutriafol dry), TF 3752 (12.5 g/L flutriafol flowable), TF 3753 (50 g/L flutriafol flowable).

METHODS: Seed was treated in jars and mixed on a roller for 15 minutes April 27. The trial was seeded May 6 with a single row cone seeder. Plots consisted of 6 rows, each 4 meters long and replicated 4 times in a randomized block design. Nitrogen was applied at a rate of 90 kg/ha and incorporated just prior to seeding. Numbers of emerged seedlings were counted, plant vigor was assessed and mildew infection was assessed by estimating percent infection on the top 3 leaves from 5 plants per plot. Yield was assessed by harvesting the entire plot.
Location: Burlington, Ontario

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Emergence was not significantly affected by any treatment. Vigor was similar for all treatments with a slight increase provided by TF 3753 at 0.1 g ai/kg. All treatments provided significant control of powdery mildew until the final assessment July 20. The greatest level of control was provided by TF 3753 at 0.2 g ai/kg and triadimenol formulations at 0.3 g ai/kg followed by TF 3753 at 0.15 g ai/kg. Yield was significantly improved by all treatments except TF 3752 and TF 3753 at 0.2 g ai/kg. TF 3480 and TF 3673 resulted in the greatest yields followed by TF 3753 at 0.15 g ai/kg.

TREATMENT	RATE[1]	EMERGENCE[2]		VIGOR[3]	PERCENT POWDERY MILDEW INFECTION[4]		
		MAY 14	MAY 19	MAY 19	July 2		
					TOP	2ND	3RD
TF 3752	0.10 g	70 a*	77 a	6.8	0.3 abc	0.6 ab	3.7 ab
TF 3673	0.10 g	70 a	74 a	6.5	0.4 abc	1.3 b	5.7 b
TF 3753	0.10 g	65 a	78 a	7.0	0.6 c	1.3 b	5.2 b
TF 3753	0.15 g	74 a	76 a	6.8	0.4 abc	0.6 ab	2.4 ab
TF 3753	0.20 g	60 a	77 a	6.5	0.1 a	0.3 ab	0.7 a
TF 3656	0.30 g	67 a	76 a	6.5	0.1 ab	0.2 a	0.6 a
TF 3480	0.30 g	67 a	69 a	6.5	0.3 abc	0.5 ab	2.7 ab
Check	-	63 a	77 a	6.8	4.0 d	9.6 c	35.0 c

TREATMENT	RATE[1]	PERCENT POWDERY MILDEW INFECTION[4]				Yield[5]
		July 7			July 20	July 31
		TOP	2ND	3RD	TOP	
TF 3752	0.10 g	1.3 ab	5.3 b	9.7 c	4.7 ab	1.20 cdef
TF 3673	0.10 g	1.0 ab	4.4 b	13.5 c	3.8 ab	1.49 a
TF 3753	0.10 g	2.1 b	6.1 b	10.0 c	11.2 b	1.31 bcd
TF 3753	0.15 g	0.6 ab	1.7 ab	5.5 ab	2.3 a	1.38 abc
TF 3753	0.20 g	0.2 a	0.5 a	1.0 a	1.2 a	1.15 def
TF 3656	0.30 g	0.2 a	0.3 a	0.8 a	0.7 a	1.25 cde
TF 3480	0.30 g	0.4 ab	0.3 a	1.6 ab	1.0 a	1.56 a
Check	-	9.3 c	29.6 c	48.0 d	37.8 c	1.05 f

1. Active ingredient per kg of seed.
2. Average percent emergence (200 seeds per row). Data has been arc-sin root transformed for analysis.
3. Vigor rating (1 = very poor, 10 = excellent).
4. Average percent infection on leaves from 5 plants per plot. (Data has been arc-sin root transformed for analysis).
5. Average yield in kg of grain per plot.

* Treatment means in the same column followed by the same letter are not significantly different at the 5% level (t-test).

CROP: Wheat cv. Katepwa

PEST: Septoria leaf and glume blotch, Septoria nodorum; leaf rust, Puccinia recondita

TITLE: EFFECTIVENESS OF FOLIAR APPLIED FUNGICIDES ON SEPTORIA LEAF AND GLUME BLOTCH AND LEAF RUST OF WHEAT.

MATERIALS: Bayleton WP (triadimenol, 50%); Dithane M-45 WP (mancozeb, 80%); HWG-1608 EC (ethyltrianol, 1.2%); Polyram DF (metiram complex, 80%); Tilt EC (propiconazole, 25%)

METHODS: Untreated seed of wheat cv. Katepwa was planted on May 12, 1987 in 4 row plots, 6 m x 1.2 m, replicated 4 times in randomized complete block design. Plants were inoculated twice, once 10 days before, and again 3 days after the first application of fungicides; macerated mycelial and conidial suspension of actively growing Septoria nodorum culture was used. Fungicides were sprayed with a Knapsack sprayer on July 7. A second spray of each of Dithane M-45 and Polyram DF was applied on July 20, 1987. The plots were lightly irrigated periodically. The diseases were estimated on scales of 0-9 on August 19, ZGS85; the top two leaves and heads of 10 randomly chosen tillers from the inner two rows in each plot were evaluated, and the average disease severities calculated. The grain yields were determined on 5 m sections of inner two rows, discounting 0.5 m sections from each end of the plot. The plots were straight combined on September 17. Thousand-kernel weights were also determined.

NAME AND AGENCY:
KHARBANDA, P.D.
TURNBULL, G.
Alberta Environmental Centre
Bag 4000
Vegreville, Alberta T0B 4L0

RESULTS: Please see table below. Though the experiment was set up for septoria leaf and glume blotch, the effectiveness of various treatments on naturally occurring rust was also recorded.

CONCLUSIONS: The disease incidence was fairly uniform throughout the plots. Except Bayleton, all other treatments gave significant control of Septoria on glumes as well as leaves. All treatments controlled rust significantly; HWG-1608 was the best treatment. There was no significant improvement in yield or 1000-kernel-weight due to the treatments.

TREATMENT		RATE (g ai/ha)	MEAN* SEPTORIA BLOTCH SEVERITY GLUMES	MEAN* SEPTORIA BLOTCH SEVERITY LEAF	MEAN* RUST SEVERITY	MEAN* 1000-KERNEL WEIGHT(g)	MEAN* YIELD(g)
HWG-1608	1.2 EC	125	2.10 bc	2.85 c	1.40 d	35.82 a	1338.1 a
BAYLETON	50 WP	125	2.45 ab	3.45 bc	2.30 bc	35.15 a	1271.3 a
TILT	25 EC	125	2.25 bc	3.60 b	2.45 b	35.76 a	1365.6 a
POLYRAM DF	80%	1800	1.95 c	2.95 bc	1.85 cd	35.87 a	1269.0 a
DITHANE M-45	80%	1800	2.00 bc	3.00 bc	1.95 bc	36.34 a	1428.8 a
CHECK			2.85 a	4.35 a	3.20 a	34.89 a	1276.3 a

*Means of 4 replications; column means followed by the same small letter do not differ significantly according to Duncan's Multiple Range Test (P + 0.05).

CROP: Wheat var. Columbus

PEST: Septoria species complex

TITLE: FOLIAR EVALUATIONS FOR CONTROL OF SEPTORIA SPECIES.

MATERIALS: FOLICUR (144 g/L ethyltrianol), TILT (250 g/L propiconazole).

METHODS: Columbus wheat was seeded May 15 southwest of Morden, Manitoba at 15 cm row spacing and 400 viable seeds/m² with a belt type cone plot seeder using the Amazone hoe opener. Prior to seeding 140 kg N/ha was banded in fall 1986 as NH_3 and 55 P_2O_5/ha, 24 kg K_2O, 24 kg S and 32 kg N/ha were banded in spring. Experimental design was a latin square one with 4 replicates using a plot size of 10 X 2M. At 275 kPa the fungicides were applied in 100 l/ha water with a compressed air bicycle sprayer July 6 at growth stage 58 Zadok's scale. Weed control was an application of Sabre June 8 and Hoegrass 284 June 12, at 560 g ai/ha and 700 g ai/ha respectively. Visual disease ratings on July 29 in percent diseased leafs, ear and stem were assessed on 10 randomly selected plants per plot following the Horsfall - Barratt Rating System. Yields were taken September 8 using a Hege small plot combine and are based on 12.5 m² (centers of each plot were harvested to compensate for border effects) and 13.5% moisture.

NAME AND AGENCY:
PHILIPP, O.
Agriprogress
R.R. #2
Thornhill, Manitoba
ROG 2TO

RESULTS: Results are summarized in the table below. Septoria spp. developed late in the season being the only disease complex of any significance. All treatments reduced total disease on the flag leaf, penultimate leaf, ear and stem. However, only the high rate of FOLICUR gave significant control on the flag and penultimate leaf while the lower rate of FOLICUR significantly reduced the disease on the penultimate leaf. All fungicides significantly reduced stem infections. Yields and thousand kernel weight (1000 kwt) did not differ from the check.

CONCLUSIONS: The foliar fungicides tested proved to be effective in reducing disease levels with the high rate of FOLICUR being superior over the other two treatments. However, no treatment did enhance yields and 1000 kernel weights. Other yield limiting environmental factors like very dry conditions during critical stages in the growing season, assumingly influenced overall yield potential.

TREATMENT	RATE (g ai/ha)	% AREA INFECTED				YIELD	
		Flag	Penultimate	Ear	Stem	kg/ha	1000 kwt (g)
Check		13.8 a	19.1 a	1.9 a	1.3 a	3487 a	34.5 a
FOLICUR	.0625	11.5 a	12.7 bc	1.7 a	.8 b	3371 a	34.2 a
FOLICUR	.125	5.5 b	9.1 b	1.4 a	.5 c	3469 a	35.2 a
TILT	.125	12.5 a	16.2 ab	1.8 a	.6 bc	3509 a	34.8 a

* Values followed by the same letter are not significantly different at the 5% level (Duncan's Multiple Range Test).

CROP: Wheat, cv. Fielder

PESTS: Tan spot, Pyrenophora tritici-repentis

TITLE: DETERMINATION OF DISEASE CONTROL AND POSSIBLE YIELD BENEFIT OF POLYRAM DF COMPARED TO STANDARDS, 1987.

MATERIALS: Polyram DF (metiram 80%)
Dithane M 45 (mancozeb 80%)
Manzate WP (maneb 80%)
Citowett Plus 50% SN

METHODS: Treatments were applied to single plots of 2 x 10 m, with a CO_2 pressurized hand-held boom. There were two spray timings at ZGS 39 and 9 days later. Application consisted of a 100 L/ha spray volume using 110015 nozzles and a pressure of 275 kPa for both timings. At application time June 17, the air temperature was 20°C with relative humidity of 84% and on June 26, it was 11°C and 70% relative humidity. Plots were replicated 4 times in a completely randomized design.

NAME AND AGENCY:
BELL, K.G.
BASF Canada Inc., P.O. Box 1855
Brandon, Manitoba R7A 6S7

On July 13, 4 flag leaves/plot were sampled. Location: Elgin, Manitoba.

RESULTS: The results are summarized in the table below.

CONCLUSIONS: The disease pressure was low. There appeared to be no phytotoxicity in any of the treatments. Treatments 3 - 8 had significantly less infection than did the check, with treatment 8 exhibiting the least. There were no significant yield differences between the check and any of the treatments, nor between treatments. Treatment 2 had the highest yield. Treatments 4 and 5 had significantly higher MKW's than did the check; however, there were no significant differences between treatments. Treatments 5 had the highest MKW. With regard to % infection, yield and MKW, there were no significant differences between Polyram DF at all rates and the standards.

TREATMENT	RATE (kg ai/ha)	% TAN SPOT LEAF INFECTION July 13	YIELD kg/ha	MKW (gms)
1. Untreated Check:	-	24a	1683a	35.5b
2. Dithane M 45/Dithane M 45	1.8/1.8	15ab	2056a	37.5ab
3. Polyram DF/Polyram DF	1.8/1.8	9b	2008a	37.3ab
4. Polyram DF/Polyram DF*	1.8/1.8	9b	1971a	37.9a
5. Maneb/Maneb	1.8/1.8	7b	1972a	38.2a
6. Polyram DF/Polyram DF	1.4/1.4	11b	1838a	36.8ab
7. Polyram DF/Polyram DF	2.2/2.2	6b	1778a	37.5ab
8. Polyram DF/Polyram DF*	2.2/2.2	5b	2024a	37.4ab

* These two treatments had Citowett Plus in each of their split applications at a rate of 0.05% v/v.

** Treatment means in the same column followed by the same letter are not significantly different at the 5% level (DMRT)

CROP: Wheat, cv. Kapetwa

PESTS: Tan spot, *Pyrenophora tritici-repentis*

TITLE: DETERMINATION OF DISEASE CONTROL AND POSSIBLE YIELD BENEFIT OF POLYRAM DF COMPARED TO STANDARDS, 1987.

MATERIALS: Polyram DF (metiram 80%)
Dithane M 45 (mancozeb 80%)
Manzate WP (maneb 80%)
Citowett Plus 50% SN

METHODS: Treatments were applied to single plots of 2 x 10 m, with a CO_2 pressurized hand-held boom. There were two spray timings at ZGS 39 and 9 days later. Application consisted of a 100 L/ha spray volume using 110015 nozzles and a pressure of 275 kPa for both timings. At application time June 17, the air temperature was 20°C with relative humidity of 84% and on June 26, it was 11°C and 70% relative humidity. Plots were replicated 4 times in a completely randomized design. On July 13, 4 leaves/plot were sampled, these leaves were the 1st leaf below the flag leaf. On July 27, 4 flag leaves/plot were sampled. Location: Elgin, Manitoba.

NAME AND AGENCY:
BELL, K.G.
BASF Canada Inc., P.O. Box 1855
Brandon, Manitoba R7A 6S7

RESULTS: The results are summarized in the table below.

CONCLUSIONS: The disease pressure in this trial was low. There did not appear to be any phytotoxicity in any of the treatments. At the 2nd evaluation all treatments had significantly lower infection levels than the check. Treatment 6 had the lowest level. There were no significant differences between treatments and the checks in either yields or MKW's. Treatment 6 had the highest yield, and treatment 2 had the highest MKW. There were no significant differences between Polyram DF at all rates and the standards regarding % infection, yield and MKW.

	TREATMENT	RATE (kg ai/ha)	% TAN SPOT LEAF INFECTION		YIELD	MKW
			July 13	July 27	kg/ha	(gms)
1.	Untreated Check:	-	9a**	32a	2395a	35.7a
2.	Dithane M 45/Dithane M 45	1.8/1.8	3a	11b	2474a	37.2a
3.	Polyram DF/Polyram DF	1.8/1.8	6a	6b	2560a	36.5a
4.	Polyram DF/Polyram DF*	1.8 /1.8	4a	9b	2492a	36.9a
5.	Maneb/Maneb	1.8 /1.8	4a	5b	2687a	37.0a
6.	Polyram DF/Polyram DF	1.4/1.4	5a	4b	3147a	37.0a
7.	Polyram DF/Polyram DF	2.2/2.2	3a	5b	2613a	36.2a
8.	Polyram DF/Polyram DF*	2.2/2.2	4a	6b	2643a	36.8a

* These two treatments had Citowett Plus in each of their split applications at a rate of 0.05% v/v.

** Treatment means in the same column followed by the same letter are not significantly different at the 5% level (DMRT)

CROP: Spring wheat var. HY 320

PEST: Common bunt, Tilletia caries

TITLE: EVALUATION OF SEED TREATMENTS FOR CONTROL OF BUNT OF SPRING WHEAT.

MATERIALS: VITAVAX SOLUTION (230 g/L carbathiin), HWG 1608 25 FS (25 g/L ethyltrianol), BAYTAN 30 FS (30 g/L triadimenol).

METHODS: Seed was inoculated in bulk with T. caries at a rate of 5 gm/kg seed. Infested seed was treated in 750 gm lots at the specified rates (see table) in glass jars. HWG 1608 treatments were diluted with water at 10 ml/kg seed. Seed was sown on April 28 with a cone seeder in single rows 6 m long replicated 4 times in a randomized complete block design. Numbers of diseased heads were counted from the middle 5 m of each row on August 16.

NAME AND AGENCY:
GIBB, W.B. and RUSSELL, R.C.
Chemagro Limited
2381 Ness Avenue
Winnipeg, Manitoba
R3J 1A5

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All treatments effectively controlled bunt with HWG 1608 at 3.0 g ai/100 kg giving total control.

TREATMENT	RATE (g ai/100 kg seed)	BUNT AS A % OF DISEASED SEED CHECK - Aug. 16	NUMBER OF BUNTED HEADS AVERAGE PER 5 M ROW, 4 REPS.
Control (Clean Seed)		1.0 a*	1.0 a
Control (Diseased Seed)		100 b	160 b
HWG 1608 25 FS	1.0	1.4 a	2.25 a
HWG 1608 25 FS	2.0	.4 a	.75 a
HWG 1608 25 FS	3.0	0 a	0 a
BAYTAN 30 FS	15.0	.3 a	.5 a
VITAVAX 230 g/L	56.0	1.6 a	2.5 a

* Values followed by the same letter are not significantly different at the 5% level (Duncan's Multiple Range Test).

CROP: Spring wheat cv. HY-320

PEST: Common Bunt, Tilletia caries (DC.) Tul and Tilletia foetida (Wallr.)

TITLE: EVALUATION OF SEED TREATMENT FUNGICIDES FOR CONTROL OF COMMON BUNT IN SPRING WHEAT, 1987.

MATERIALS: Vitavax® Solution (SU) (carbathiin 23%); AGROX® (SN) (maneb 300g. ai./L); XE-779 (WP) (triazol 25%); AGSCO® DB RED (SN) (maneb 25.6% and lindane 8.6%); BAY HWG 1608 (SN) (triazol 2.5 g. ai./L); UBI 2454 (SN) (unknown 100 g. ai./L); UBI 2466 (SN) (triadimenol 60 g. ai./L and thiram 200 g. ai./L) and RH 5782 (unknown 60 g. ai./L).

METHODS: Seed was inoculated in bulk with a mixture of Tilletia foetida and T. caries at 0.83 g. of ground bunt balls per 100 g. of seed. Infested seed was treated in 300 g. lots at the specified rates (see Table) in 1-L cylinders. The cylinders were mounted on a rotary action shaker and agitated for 20 minutes to obtain even coverage with the fungicide. The initial treatment which precoated the flasks was discarded. Seed was sown 3 cm deep at 10 g. per 5 m. single row in four-replicated randomized block.

NAME AND AGENCIES:

PUCHALSKI, B. J., GAUDET, D. A. and KRAMER, J.
Agriculture Canada Research Station
P. O. Box 3000, Main
Lethbridge, Alberta

BUCKLEY, H.
Agriculture Canada Research Station
Saskatoon, Saskatchewan

Field tests were sown at Lethbridge and Lacombe, Alberta; Saskatoon, Saskatchewan and Creston, B. C. At the 3 leaf stage, emerged tillers were counted in each plot at Saskatoon. Two hundred tillers were harvested and rated for bunt.

RESULTS: Since seedling counts among treatments did not differ (P = 0.050), these results were omitted from the table. The efficacy results are summarized below.

CONCLUSIONS: Bunt infection levels were low at all locations except Saskatoon. None of the treatments were found to be phytotoxic. All products tested with the exception of Vitavax® and Agrox® provided greater than 95 % control. Bunted grain at the 1% infection level results in the wheat being graded as feed due to odor. UBI 2454, XE-779, RH 5782 and BAY HWG 1608 provided adequate control to prevent grade losses.

Treatment			% Bunted Spikes[1]			
Product	Formulation[2]	Rate ai/kg seed	Lethbridge	Creston	Lacombe	Saskatoon
None[3]			3.5 bcd	0.3 b	13.3 bc	2.8 c
None			39.1 a	14.9 a	37.5 a	84.8 a
Agrox®	SN	0.54 ml	4.9 b	0.9 b	7.9 cd	17.3 b
Agsco® DB	SN	0.83 ml	0.9 cd	0.9 b	5.1 de	0.8 c
Vitavax®	SU	0.76 g	1.0 cd	1.9 b	5.5 de	5.1 c
UBI-2454	SN	0.1 g	0.5 cd	0.0 b	0.4 e	0.0 c
UBI-2466	SN	0.5 g	1.0 cd	0.0 b	1.1 e	0.1 c
RH-5782	SN	0.05 g	0.0 d	0.0 b	0.4 e	0.0 c
XE-779	WP	0.033 g	0.0 d	0.0 b	0.3 e	0.0 c
XE-779	WP	0.046 g	0.0 d	0.2 b	0.3 e	0.0 c
BAY HWG	SN	0.03 g	0.0 d	0.0 b	0.3 e	0.0 c

[1]Analysis of variance and Duncan's Multiple Range Test were applied to the percent bunt data. Means at each location followed by a common letter do not differ at P = 0.05.
[2]SU - suspension, SN = solution, WP = wettable powder.
[3]Seed not infested or treated with fungicide.

CROP: Spring wheat, cultivar Leader

PEST: Common root rot, Cochliobolus sativus

TITLE: EFFECT OF SEED TREATMENT FUNGICIDES ON EMERGENCE, COMMON ROOT ROT AND YIELD OF LEADER SPRING WHEAT.

NAME AND AGENCY:
McCURDY, S.L., DUCZEK, L.J.
Research Station, Agriculture Canada
107 Science Crescent
Saskatoon, Saskatchewan
S7N 0X2

KHARBANDA, P.D., TURNBULL, G.
Alberta Environmental Centre
Vegreville, Alberta
TOB 4LO

MATERIALS: Chipman: AGROX FLOWABLE (maneb 250 g/L), TF 3752 (flutriafol 12.5 g/L) and TF 3656 (triadimenol 75 g/L); Elanco: A0201 (imazalil 48 g/L) and EL228/FN5116 (nuarimol 50 g/L); Rohm and Haas: RH 7592 (60 g/L); Uniroyal: UBI 2100-2 (carbathiin 230 g/L), UBI 2155 (carbathiin 26.7% + thiram 38.8%), UBI 2446 (carbathiin 230 g/L + imazalil 21 g/L), UBI 2454/RH 3866 (systane 100 g/L).

METHODS: The test was done at Saskatoon, Saskatchewan and Vegreville, Alberta in 1987. Naturally occurring inoculum of C. sativus was relied upon for infection. Seed was treated on April 22. Using 500 g glass jars, 200 g of seed was treated at one time by first distributing the chemical over the glass surface and then by adding the seed and shaking. The first lot of seed was discarded and the next two lots were treated and combined (total of 400 g of seed). Treatments were used undiluted. At Saskatoon, treatments were replicated six times in a randomized complete block design. Each plot was 4 rows, each row was 5 m long. Rows were 23 cm apart with 350 seeds planted in each row. Seeding and fertilizing (40 kg/ha with 11-55-0) occurred on May 19; emergence was recorded on June 10 in 2 m of both center rows; harvesting (4 rows x 5 m long) was done on September 14 with yield recorded as grams per plot; common root rot was recorded on September 16 by rating 50 plants in each plot as the number of plants showing lesions covering greater than 50% of the subcrown internode. Percent common root rot was calculated by multiplying the field score by two.

At Vegreville, treatments were replicated four times in a randomized complete block design. Each plot contained 4 rows each 6 m long and 0.2 m apart with 225 seeds planted per row. Seed was planted 8 cm deep on May 12; emergence was recorded on May 25 in 1 m of both center rows; common root rot was recorded on August 31 by rating 25 plants selected at random from the outside 2 rows as the number of plants showing lesions covering greater than 50% of the subcrown internode; harvesting of the center 2 rows was done on September 22 with yield recorded as grams per plot. Percent common root rot was calculated by multiplying the field score by four.

RESULTS: The results are summarized in the table below.

CONCLUSIONS: At Saskatoon, the treatments did not vary significantly from the control for yield. Four treatments and the control had significantly higher emergence than the rest: UBI 2100-2, UBI 2155, TF 3752 (0.025 g a.i./kg seed) and RH 7592 (0.10 g a.i./kg seed). Root rot was significantly less than the control in all but three treatments: UBI 2100-2, UBI 2155 and Agrox Flowable. Though not statistically significant, TF 3752 (0.025 g a.i./kg seed) has a higher emergence and yield when compared to the control and the other treatments and a statistically significant lower percentage of common root rot than the control. Three products were used at two different rates, UBI 2454/RH 3866, TF 3752 and RH 7592. Although none of the differences in results between the lower and higher rates are statistically significant, emergence and yield are all less in the higher rate than in the lower rate.

At Vegreville, the treatments did not vary significantly from the control for percent common root rot, emergence or yield. Although not statistically significant, UBI 2454 at 0.22 g a.i./kg was the only treatment to have a lower emergence than the control. Lower yields than the control are also recorded for UBI 2454. Although not statistically significant, TF 3752 and UBI 2454 showed an increase in yield at the higher application rate. Highest yields occurred with Agrox Flowable and UBI 2155.

Product	Rate g a.i. per kg seed	Emergence*		Percent Common Root Rot*		Yield*	
		Saskatoon	Vegreville	Saskatoon	Vegreville	Saskatoon	Vegreville
Control (No treatment)	—	183 a	38 ab	48 a	16 a	1131 a	661 a
UBI 2100-2	0.55	181 a	44 ab	47 a	17 a	1194 a	673 a
UBI 2155	0.53 + 0.78	192 a	53 a	52 a	15 a	1186 a	770 a
UBI 2446	0.55 + 0.05	161 abc	41 ab	30 bc	26 a	1249 a	690 a
UBI 2454/RH 3866	0.18	138 bc	36 ab	8 de	24 a	1252 a	569 a
UBI 2454/RH 3866	0.22	130 c	30 b	7 e	16 a	1172 a	610 a
TF 3656	0.15	160 abc	46 ab	12 de	18 a	1150 a	705 a
TF 3752	0.025	180 a	48 ab	24 bcd	13 a	1218 a	578 a
TF 3752	0.05	167 ab	40 ab	8 de	11 a	1202 a	677 a
RH 7592	0.10	188 a	46 ab	18 cde	14 a	1083 a	630 a
RH 7592	0.30	173 ab	47 ab	22 cde	14 a	1086 a	623 a
EL 288/EN 5116	0.10	130 c	44 ab	7 e	25 a	1175 a	682 a
A0201	0.10	170 ab	44 ab	18 cde	16 a	1228 a	602 a
Agrox Flowable	0.45	169 ab	49 ab	38 ab	17 a	1229 a	771 a

* Values in the same column which are not followed by the same letter are significantly different at the 0.01 level of probability according to Duncan's Multiple Range Test.

CROPS: Spring Wheat, Manitou/Tobari 66//Kitt; Oats, cv. Random.

PESTS: Loose Smut of Wheat, Ustilago tritici; Loose Smut of Oats, U. avenae.

TITLE: EFFICACY OF SEED TREATMENT FUNGICIDES TO CONTROL LOOSE SMUT OF WHEAT AND LOOSE SMUT OF OATS - Cooperative Trials 1987.

MATERIALS: VITAVAX SOLUTION (230 gai carbathiin/L); UBI 2454 (100 gai myclobutanil/L); UBI 2466 (60 gai BAYTAN + 200 gai THIRAM/L); PP450 (Du, 2.5% flutriafol; Fl, 12.5 gai flutriafol /L); CGA-453 30% WP; HWG 1608 (Du, 2.5%; Fl, 25 gai ethyltrianol); RH-7592 (EC, 60 gai/L)

METHODS: For the test on loose smut of wheat naturally infected seed was used. Oats were inoculated by the partial vacuum method with 100mg spores/litre water. The seed of both crops was produced, inoculated and treated at Winnipeg. - To minimize the variability caused by uneven distribution of the formulation in the seed sample, all liquid formulations were diluted. The diluent and the ml/kg of diluted formulation applied are indicated in the Table below.- Samples of 200 g seed were treated in pre-coated glass jars, and then each treatment divided into 12 subsamples. Four subsamples, each of 300 kernels, were planted in 4m rows in a randomized block design at each of the three test locations: Saint-David, Winnipeg and Lacombe. Percent control by each treatment was based on counts of tillers in 2.5m of each row, and calculated by the formula 100-(mean percent infection : mean percent infection in untreated check x 100).

NAMES AND AGENCIES:

NIELSEN, J.J., Agriculture Canada, Reseach Station 195 Dafoe Road, Winnipeg MB, R3T 2M9

COUTURE, L., Agriculture Canada, Station de Recherches, 2560 Boul. Hochelaga, Sainte-Foy PQ, G1V 2J3

PIENING, L.J., Agriculture Canada, Research Station Lacombe AB, T0C 1S0

RESULTS: See Table. - Since the same seed was used at the three locations, the results again demonstrated the effect of environment on the level of infection in the untreated check (particularly with the seedling-infecting U. avenae) and on the level of control (particularly in the embryo-infecting U. tritici). - None of the treatments was phytotoxic.

CONCLUSION: Adequate control at all three locations was achieved with
Ustilago tritici in wheat by
UBI 2454,
HWG 1608 Fl at 0.02 and 0.03 gai,
HWG 1608 Du at 0.03 gai,
RH-7592;
Ustilago avenae on oats by
VITAVAX SOLN.,
UBI 2454,
UBI 2466,
PP450 Du,
PP450 Fl at 0.05 gai,
CGA-453 WP at 0.4 and 0.6 gai,
HWG 1608 Fl at 0.03 gai,
HWG 1608 Du at 0.03 gai,
RH-7592 at 0.1 and 0.3 gai.

Treatment	Rate (gai/kg)	Diluent; total ml/kg applied	% Control of Ustilago tritici at Saint-David	Winnipeg	Lacombe	Ustilago avenae at Saint-David	Winnipeg	Lacombe
VITAVAX SOLN.	0.69	methanol; 5	67.5 e	89.6 b	90.6 b	100 a	100 a	100 a
UBI 2454	0.2	water; 5	92.2 b	96.0 a	98.4 a	100 a	100 a	100 a
"	0.25	" ; 5	89.6 b	97.6 a	100 a	100 a	100 a	100 a
UBI 2466	0.15/0.5	water; 5	87.1 c	97.6 a	94.1 b	100 a	100 a	100 a
PP450 Du	0.05	-	80.4 d	93.6 b	94.1 b	100 a	99.5 a	100 a
PP450 Fl	0.025	water; 5	79.3 d	92.7 b	94.0 b	98.3 a	94.5 b	83.7 c
"	0.05	" ; 5	76.6 d	96.0 a	98.4 a	100 a	100 a	99.7 a
CGA-453 WP	0.2	water; 8	87.1 c	94.3 b	92.3 b	92.6 b	94.9 b	91.7 b
"	0.4	" ; 8	84.7 c	94.3 b	96.6 a	100 a	100 a	99.1 a
"	0.6	" ; 8	83.1 c	90.3 b	100 a	98.6 a	100 a	99.1 a
HWG 1608 Fl	0.01	water; 10	89.6 b	94.3 b	95.7 a	98.3 a	96.0 b	91.9 b
"	0.02	" ; 10	93.5 b	96.0 a	98.4 a	100 a	96.4 b	95.8 b
"	0.03	" ; 10	96.2 a	99.1 a	100 a	100 a	100 a	99.1 a
HWG 1608 Du	0.03	-	94.8 a	96.8 a	98.4 a	100 a	100 a	100 a
RH-7592	0.05	xylene; 5	88.3 b	97.6 a	100 a	98.3 a	98.9 a	95.8 b
"	0.1	" ; 5	92.2 b	95.1 a	99.1 a	100 a	100 a	98.8 a
"	0.3	" ; 5	98.8 a	97.6 a	100 a	100 a	99.5 a	100 a
The results above are based on:								
% infection in untreated check			8.8	8.2	7.9	23.4	10.9	29.0
mean number of tillers/2.5m row			219	374	371	128	453	290

Values in one column and not followed by a common letter are significantly different at P = 0.05.

CROP: Spring wheat cv. Fielder

PEST: Powdery mildew, Erysiphe graminis f.sp. tritici, Septoria tritici blotch, Mycosphaerella graminicola, Septoria nodorum blotch, Phaeosphaeria nodorum

TITLE: CONTROL OF FOLIAR DISEASES IN FIELDER SPRING WHEAT.

NAME AND AGENCY:
BLYDORP, L.J., DENTZ, C.B. and TOLTON, D.A.
Chemagro Limited
256 Britannia Road East
Mississauga, Ontario, L4Z 1S6

MATERIALS: BAYLETON 50 WP (triadimefon), POLICUR 1.2 EC (144 g ai/L ethyltrianol), TILT 250 EC (propiconazole).

METHODS: Wheat was planted on April 24, 1987 in 11.4 cm rows at a rate of 150 kg/ha with a commercial grain drill in a silt loam soil near Clinton, Ontario. Plots were 2.0 m wide, 7.0 m long and replicated 4 times in a randomized complete block design. P and K were applied according to soil test. 118 kg N/ha was applied in 2 applications; 58 kg/ha May 14 and 60 kg/ha June 5. Fungicide applications were made on June 18 at Zadok's Growth Stage (ZGS) 49 when disease was present half way up the plants. Treatments were applied with a CO_2 powered back pack sprayer delivering 200 L/ha through 8002 teejet flat fan nozzles at 200 kPa. Disease was evaluated by assessing the penultimate leaf on July 3 at ZGS 73 and again on July 8 at ZGS 77 of five plants per plot and visually estimating the percent diseased leaf area. Yields were taken on August 13 by harvesting a 1.3 m strip down the center of each plot using an Almaco small plot combine.

RESULTS: The results are summarized in the table below. All treatments reduced powdery mildew and septoria levels significantly on the penultimate leaf but differences were not observed among treatments. The leaf septoria was diagnosed to be both Phaeosphaeria nodorum and Mycosphaerella graminocola. Differences in yield and thousand kernel weight (1000 kwt) were observed but there was no consistency to the results.

CONCLUSIONS: All foliar fungicide treatments decreased foliar disease significantly. Weed pressure from (wild buckwheat, Polygonum convoluulus and lady's thumb, Polygonum pennsylvanicum) in the plot area, likely caused inconsistencies in the yield data.

TREATMENT	RATE (Kg ai/ha)	APPLICATION Date	APPLICATION ZGS	% POWDERY MILDEW Penultimate Leaf 7/3	% POWDERY MILDEW Penultimate Leaf 7/8	% SEPTORIA Penultimate Leaf 7/8	1000 kwt (g)	YIELD (t/ha)
CONTROL	-	-	-	4.5 a*	17.2 a	13.5 a	33.8 b	3.79 c
BAYLETON 50 WP	.125	6/13	43	1.4 b	1.5 b	3.3 b	35.5 ab	4.39 ab
BAYLETON 50 WP	.250	6/13	43	1.3 b	1.7 b	4.2 b	34.8 ab	3.68 c
POLICUR 1.2 EC	.125	6/13	43	2.4 b	2.4 b	1.0 b	37.3 a	4.57 a
POLICUR 1.2 EC	.250	6/13	43	1.3 b	1.0 b	3.9 b	32.5 b	3.93 bc
TILT 250 EC	.125	6/13	43	1.0 b	2.0 b	4.2 b	33.8 b	4.14 abc

* Values in the same column which are followed by the same letter are not significantly different at the P= 0.05 level (Duncan's Multiple Range Test).

CROP: Spring Wheat cv. Katepwa

PEST: Powdery mildew, Erysiphe graminis f.sp. tritici, Septoria nodorum blotch, Phaeosphaeria nodorum

TITLE: CONTROL OF FOLIAR DISEASES IN KATEPWA SPRING WHEAT I.

NAME AND AGENCY:
BLYDORP, L.J. DENTZ, C.B. and TOLTON, D.A.
Chemagro Limited
256 Britannia Road East
Mississauga, Ontario, L4Z 1S6

MATERIALS: BAYLETON 50 WP (triadimefon), POLICUR 45 DF (ethyltrianol), POLICUR 1.2 EC (144 g ai.L ethyltrianol), TILT 250 EC (propiconazole).

METHODS: Wheat was planted on April 11, 1987 in 10 cm rows at a rate of 400 seeds/m^2 with a Wintersteiger small plot cone seeder in a Harriston Silt Loam soil near Harriston, Ontario. Plots were 1.0m wide, 6.5m long and replicated 4 times in a randomized complete block design. A 25 cm bare strip separated each plot. P and K were applied according to soil test. 100 kg N/ha was applied on May 1 followed by 90 kg N/ha at Zadok's Growth Stage (ZGS) 45. The plant growth regulator Cycocel extra (460 g ai/L chlormequat chloride) was applied at ZGS 31 at a rate of 0.3 L/ha. Treatments 2 through 9 received a single fungicide application at first sign of disease (June 10). Treatments 10-14 received 2 fungicide applications, the first also on June 10, and the second three weeks later (July 1). Treatments were applied with a CO_2 powered back pack sprayer delivering 200 L/ha through 8002 teejet flat fan nozzles at 200 kPa to every other plot. Disease was evaluated by assessing the third leaf on July 2 at ZGS 74 and the penultimate leaf on July 13 at ZGS 79. Percent diseased leaf area was visually estimated of five plants/plot. Yields were taken on July 30 using an Almaco small plot combine.

RESULTS: The results are summarized in the table below. All treatments reduced powdery mildew and septoria levels significantly compared to the check. The leaf septoria was diagnosed to be predominately Phaeosphaeria nodorum with some Mycosphaerella graminicola present. Yields and thousand kernel weight (1000 kwt) are presented. Only POLICUR 1.2 EC at the low rate increased yield over the check.

CONCLUSIONS: Powdery mildew and septoria levels were significantly reduced with the application of foliar fungicides. Double application treatments were not more effective in controlling disease than single applications although differences may have been observed had disease infestations been heavier.

TREATMENT[1]	RATE (kg ai/ha)	APPLICATION Date	APPLICATION ZGS	% POWDERY MILDEW 3rd leaf 7/2; ZGS 74	% SEPTORIA Flag Leaf 7/13; ZGS 79	1000 kwt (g)	YIELD (t/ha)
Control	-	-	-	4.8 a*	10.3 a	33.3 ab*	3.65 b
POLICUR 450 DF	.125	6/10	39	0.7 b	2.3 c	32.0 b	3.70 ab
POLICUR 1.2 EC	.125	6/10	39	0.2 b	1.8 c	36.3 a	4.17 a
POLICUR 1.2 EC	.1875	6/10	39	0.2 b	1.4 c	34.5 ab	3.95 ab
POLICUR 1.2 EC	.250	6/10	39	0.1 b	2.9 c	34.5 ab	4.04 ab
BAYLETON 50 WP	.125	6/10	39	0.1 b	4.2 bc	33.5 ab	4.04 ab
BAYLETON 50 WP	.1875	6/10	39	0.0 b	7.2 ab	32.8 ab	3.80 ab
BAYLETON 50 WP	.250	6/10	39	0.0 b	2.4 c	35.0 ab	3.84 ab
TILT 250 EC	.125	6/10	39	0.1 b	4.1 bc	33.0 ab	4.14 ab
BAYLETON 50 WP	.125	6/10	39				
U BAYLETON 50 WP	.125	7/1	68	0.0 b	2.5 c	34.8 ab	4.04 ab
BAYLETON 50 WP	.125	6/10	39				
U POLICUR 1.2	.125	7/1	68	0.0 b	0.5 c	35.0 ab	3.91 ab
POLICUR 1.2 EC	.125	6/10	39				
U POLICUR 1.2 EC	.125	7/1	68	0.1 b	1.1 c	34.0 ab	4.09 ab
BAYLETON 50 WP	.125	6/10	39				
U TILT 250 EC	.125	7/1	68	0.0 b	1.9 c	34.0 ab	3.82 ab
TILT 1.2 EC	.125	6/10	39				
U TILT 2.50 EC	.125	7/1	68	0.0 b	1.1 c	33.8 ab	3.84 ab

1. "U" refers to sequential application.

* Values in the same column which are followed by the same letter are not significantly different at the P = 0.05 level (Duncan's Multiple Range Test).

CROP: Spring Wheat cv. Katepwa

PEST: Powdery mildew, Erysiphe graminis f.sp. tritici, Septoria tritici blotch, Mycosphaerella graminicola, Septoria nodorum blotch, Phaeosphaeria nodorum

TITLE: CONTROL OF FOLIAR DISEASES IN KATEPWA SPRING WHEAT II.

NAME AND AGENCY:
BLYDORP, L.J., DENTZ, C.B. and TOLTON, D.A.
Chemagro Limited
256 Britannia Road East
Mississauga, Ontario, L4Z 1S6

MATERIALS: BAYLETON 50 WP (triadimefon), POLICUR 1.2 ec (144 g ai/L ethyltrianol), TILT 250 EC (propiconazole).

METHODS: Wheat was planted on April 22, 1987 in 17.8 cm rows at a rate of 155 kg/ha with a conventional grain drill in a clay loam soil near Wingham, Ontario. Plots were 2.0 m wide, 7.0 m long and replicated 4 times in a randomized complete block design. P and K were applied according to soil test. 65 kg N/ha was spring applied. Fungicide applications were made on June 13 at Zadok's Growth Stage (ZGS) 43 when disease was present half way up the plants. Treatments were applied with a CO_2 powered back pack sprayer delivering 200 L/ha through 8002 teejet flat fan nozzles at 200 kPa. Disease was evaluated by assessing the penultimate leaf on June 25 at ZGS 65 and again on July 8 at ZGS 78 of five plants per plot and visually estimating the percent diseased leaf area. Yields were taken on August 13 by harvesting a 1.3 m strip down the center of each plot using an Almaco small plot combine.

RESULTS: The results are summarized in the table below. All treatments significantly reduced disease levels on the penultimate leaf. The leaf septoria rated on July 8 was diagnosed to be predominately Phaeosphaeria nodorum with some Mycosphaerella graminicola also present. All treatments yielded higher than the check. Hectolitre weights and thousand kernel weights (1000 Kwt) are also presented but significant differences were not observed.

CONCLUSIONS: All foliar fungicide treatments decreased foliar disease levels significantly.

TREATMENT	RATE (kg ai/ha)	APPLICATION Date	APPLICATION ZGS	% POWDERY MILDEW Penultimate Leaf 6/25	% POWDERY MILDEW Penultimate Leaf 7/8	% SEPTORIA 2nd Leaf 7/8	Hectolitre Weight (kg)	1000 kwt (g)	YIELD (t/ha)
CONTROL	-	-	-	15.6 a*	29.0 a	33.0 a	76.9 ab	34.0 a	2.40 b
BAYLETON 50WP	.125	6/13	43	0.0 b	0.2 b	14.0 b	77.8 a	34.0 a	2.52 ab
BAYLETON 50WP	.250	6/13	43	0.0 b	0.6 b	2.6 c	77.8 a	34.0 a	2.87 ab
POLICUR 1.2 EC	.125	6/13	43	0.4 b	1.2 b	6.6 bc	77.8 a	34.0 a	2.90 ab
POLICUR 1.2 EC	.250	6/13	43	0.8 b	0.0 b	6.4 bc	76.5 b	33.0 a	2.85 ab
TILT 250 EC	.125	6/13	43	1.4 b	0.8 b	11.2 b	77.6 a	33.0 a	2.94 a

* Values in the same column which are followed by the same letter are not significantly different at the P = 0.05 level (Duncan's Multiple Range Test).

CROP: Spring Wheat, cv. Fielder

PEST: Powdery mildew, Erysiphe graminis f.sp. tritici

TITLE: EFFECTS OF SEED TREATMENTS ON PROGRESS OF POWDERY MILDEW IN SPRING WHEAT

MATERIALS: VITAFLO 280 (carbathiin 14.9% + thiram 13.2%), ANCHOR (carbathiin 6.7% + thiram 6.7%), UBI-2383-1 (triadimenol 31.7% flowable), UBI-2394-2 (carbathiin 22% + thiabendazole 2.4% + imazalil 2.0%), UBI-2395-1 (thiabendazole 24%), UBI-2454 (RH 3866 10% CE), UBI-2455 (RH 3866 8.3% + thiabendazole 2.5%) TF-3752 (flutriafol 1.25% flowable), TF-3753 (flutriafol 5%), CGA-449 20 WS.

METHODS: Wheat seeds were treated with the various fungicides at doses indicated in the table. Each fungicide was applied in a glass jar which was rotated for 20 min. The wheat was sown on 21 April 1987 in plots (1 m x 2 m) at the Arkell Research Station. The rows were 17.8 cm apart and the seeding rate was 130 kg/ha. Each treatment was replicated four times in a randomized complete block design. No wheat had been grown in the plot area during the preceding four years. Winter wheat grown about 20 m from the plot area in 1986-87 was the presumed source of E. graminis f.sp. tritici which initiated the powdery mildew epidemics in the spring wheat plots. Disease was assessed on the second youngest and fully expanded leaf on 29 May (day 38) and on the third youngest and fully expanded leaf on 5 June (day 45). Both of these leaves were shown to be leaf 4 after the flag leaf emerged. Disease was assessed on leaf 3 on 17 June (day 57). The Horsfall-Barratt scale was used for all assessments.

NAME AND AGENCY:
SUTTON, J.C. and TUREK, R.
Department of Environmental Biology, University of Guelph, Guelph, Ontario, N1G 2W1

RESULTS: Results are presented in the table.

CONCLUSIONS: Fungicide formulations containing triadimenol (UBI-2383-1 and UBI-2383-1 plus UBI-2395-1) or flutriafol (TF-3752 and TF-3753) completely suppressed powdery mildew until 38 days after the wheat was sown, and limited disease intensity to ≤ 1.5% until at least 57 days after sowing, or 2 - 5 days before the spikes emerged. Formulations containing RH 3866 (UBI-2454 and UBI-2455) also were highly effective in suppressing powdery mildew. Some disease suppression was evident at various times of assessment in wheat treated with Anchor, UBI-2394-2 and CGA-449. Vitaflo 280 was ineffective.

Fungicide		Estimated disease intensity (%)		
Product	Dose (g a.i./kg seed)	Leaf 4 29 May (GS*30)	Leaf 4 5 June (GS 35)	Leaf 3 17 June (GS 45-48)
Check	-	35.0 c**	84.1 d	32.9 d
VITAFLO	0.58	41.4 c	81.5 d	32.7 d
ANCHOR	1.07	26.5 b	58.0 c	17.5 c
UBI-2383-1	0.16	0.0 a	0.4 a	1.3 a
UBI-2383-1 + UBI-2395-1	0.16 + 0.06	0.0 a	0.8 a	1.3 a
UBI-2394-2	0.29	33.4 bc	65.9 c	29.0 d
UBI-2454	0.20	1.2 a	18.9 b	11.5 bc
UBI-2455	0.26	0.8 a	7.9 ab	7.1 ab
TF-3752	0.10	0.0 a	0.7 a	1.5 a
TF-3753	0.10	0.0 a	0.2 a	0.6 a
CGA-449	0.40	41.7 c	53.7 b	12.7 bc

* Growth stage on scale of Zadoks, Chang and Konzak

** Values in a column followed by the same letter are not significantly different ($P \leq 0.05$, Duncan's multiple range test).

CROP: Spring wheat, cv. Max.

PEST: Septoria leaf and glume blotch, Septoria nodorum

TITLE: RESPONSE OF SPRING WHEAT TO FOLIAR FUNGICIDES FOR SEPTORIA CONTROL IN THE ATLANTIC PROVINCES, 1987.

MATERIALS: BENLATE (benomyl 50%WP), BRAVO (chlorothalonil, 500 g/l), DITHANE M45 (mancozeb, 80WP), FOLICURE (HWG1608, 144 g/l), TILT (propiconazole, 250EC).

METHODS: Blocks of Max spring wheat were established in Truro, Nova Scotia; Hartland, New Brunswick; and Charlottetown, Prince Edward Island in early May of 1987. Plot size was 2m wide by 5 or 6m long replicated 4 times. Treatments were arranged in a randomized complete block design. Fungicides were applied at Zadoks growth stage (ZGS) 31,39, and 57. Septoria severity was rated on both leaves and heads. Yield was estimated at each site by harvesting a 1.25m strip from the centre of each plot using a Hege small plot combine.

NAME AND AGENCY:
JOHNSTON, H.W., WALKER, D. and MELLISH, D.
Agriculture Canada, Research Station
Charlottetown, Prince Edward Island C1A 7M8
and
N.B. Dept. of Agriculture and Rural Development
Fredericton, New Brunswick
and
N.S. Dept. of Agriculture and Marketing
Truro, N.S., respectively

RESULTS: See table below.

CONCLUSIONS: Unusually dry summer weather at all three locations resulted in very low levels of disease. No significant differences in septoria severities occurred in the trials. Seed weights (TWK) were increased primarily by fungicides applied at ZGS 39 and 57 at Truro only. The grain yields at the 3 locations were not affected by the treatments applied. Foliar diseases were unlikely to have been yield limiting in this trial.

TREATMENT	RATE (g a.i./ha)	APPLICATION (ZGS)	TRURO		HARTLAND		CHARLOTTETOWN	
			TKW(g)	YIELD(t/ha)	TKW(g)	YIELD(t/ha)	TKW(g)	YIELD(t/ha)
Check	-	-	43.5	5.2	40.0	4.0	34.4	2.3
TILT	125	31	43.9	5.3	40.1	4.1	35.2	2.5
TILT	125	39	44.6	5.6	40.8	4.3	34.0	2.3
TILT	125	57	46.4	5.8	40.8	4.2	34.3	2.4
TILT/BRAVO	125/1000	31	44.3	5.3	39.8	4.1	34.7	2.7
TILT/BRAVO	125/1000	39	46.4	5.4	40.4	4.3	35.2	2.6
TILT/BRAVO	125/1000	57	47.0	5.5	40.8	4.2	35.9	2.6
TILT/DITHANE	125/1760	31	45.3	5.6	39.5	4.1	34.9	2.6
TILT/DITHANE	125/1760	37	45.0	5.5	39.9	4.2	34.2	2.4
TILT/DITHANE	125/1760	57	45.8	5.5	41.6	4.1	35.7	2.5
TILT	125	31+57	46.1	5.4	41.3	4.3	34.0	2.5
TILT+TILT/ BRAVO	125+125/ 1000	31+57	47.3	5.8	41.7	4.1	34.4	2.5
TILT+TILT/ DITHANE	125+125/ 1760	31+57	46.5	5.3	40.3	4.1	34.8	2.5
TILT	125	39+57	46.7	5.6	40.8	4.3	35.4	2.3
TILT/BRAVO	125+1000	39+57	47.4	5.4	40.1	4.3	35.2	2.4
TILT/DITHANE	125/1760	39+57	47.2	5.4	40.5	4.3	34.6	1.9
BRAVO	1000	39+57	45.8	5.5	42.7	4.4	35.3	2.5
DITHANE	1760	39+57	45.5	5.6	39.7	4.0	34.8	2.5
FOLICURE	125	31	44.3	5.1	41.6	4.1	34.5	2.5
FOLICURE	125	39	46.0	5.7	40.6	4.4	33.7	2.4
FOLICURE	125	57	45.8	5.4	40.9	4.2	35.0	2.5
TILT+TILT/ BRAVO/BENLATE	125+125/ 1000/250	31+57	47.0	5.6	42.0	4.2	34.8	2.6
LSD (0.05)			1.5	NS	NS	NS	NS	NS

CROP: Spring Wheat cv. Max

PEST: Septoria nodorum blotch, Phaeosphaeria nodorum

TITLE: CONTROL OF FOLIAR DISEASES IN MAX SPRING WHEAT.

NAME AND AGENCY:
BLYDORP, L.J., DENTZ C.B. and TOLTON, D.A.
Chemagro Limited
256 Britannia Road East
Mississauga, Ontario, L4Z 1S6

MATERIALS: BAYLETON 50 WP (triadimefon), FOLICUR 45 DF (ethyltrianol), FOLICUR 1.2 EC (144 g ai/L ethyltrianol), TILT 250 EC (propiconazole).

METHODS: Wheat was planted on April 11, 1987 in 10 cm rows at a rate of 400 seeds/m^2 with a Wintersteiger small plot cone seeder in a Harriston silt loam soil near Harriston, Ontario. Plots were 1.0 m wide, 6.5 m long and replicated 4 times in a randomized complete block design. A 25 cm bare strip separated each plot. P and K were applied according to soil test. 100 kg N/ha was applied on May 1 followed by 90 kg N/ha at Zadok's Growth Stage (ZGS 45). The plant growth regulator Cycocel Extra (460 g ai/L chlormequat chloride) was applied at ZGS 31 at a rate of 0.3 L/ha. Treatments 2-9 received a single fungicide application at first sign of disease (June 10). Treatments 10-14 received 2 fungicide applications, the first also on June 10, and the second three weeks later (July 1). Treatments were applied with a CO_2 powered back pack sprayer delivering 200 L/ha through 8002 teejet flat fan nozzles at 200 kPa to every other plot. Disease was evaluated by assessing the third leaf on July 9, 1987 at ZGS 78. Percent diseased leaf area was visually estimated of five plants/plot. Yields were taken on July 30 using an Almaco small plot combine.

RESULTS: The results are summarized in the table below. FOLICUR and TILT treatments effectively controlled septoria with no significant differences in disease levels observed between single and double applications. BAYLETON was less effective in controlling septoria. Only BAYLETON at the high rate as a single treatment and a BAYLETON followed by TILT double application treatment gave significant septoria control. Although double application treatments of FOLICUR 1.2 EC and TILT did not provide significantly better septoria control than single applications they did give slightly higher yields. FOLICUR and TILT treatments had higher thousand kernel weights (1000 kwt) and lower hectolitre weights than the check, but these differences were not always significant. The double application of FOLICUR 1.2 EC gave the highest 1000 kwt and the lowest hectolitre weight.

CONCLUSIONS: Foliar fungicides especially FOLICUR and TILT were effective in reducing levels of septoria. Treatments that gave significant disease control generally increased yields significantly.

TREATMENT[1]	RATE (kg ai/ha)	APPLICATION Date	ZGS	% SEPTORIA 3rd Leaf 7/9; ZGS 78	Hectolitre Weight (kg)	1000 kwt (g)	YIELD (t/ha)
CONTROL	-	-	-	29.1 a*	75.7 a	35.3 e	4.86 e
FOLICUR 450 DF	.125	6/10	39	6.8 bc	75.0 ab	37.5 a-e	5.26 a-d
FOLICUR 1.2 EC	.125	6/10	39	3.7 c	74.5 ab	37.5 a-e	5.47 abc
FOLICUR 1.2 EC	.1875	6/10	39	4.8 c	73.0 abc	38.0 a-e	5.19 b-e
FOLICUR 1.2 EC	.250	6/10	39	3.2 c	72.2 bc	39.0 a-d	5.27 a-d
BAYLETON 50WP	.125	6/10	39	22.2 ab	75.8 a	36.0 cde	5.02 de
BAYLETON 50WP	.1875	6/10	39	15.4 abc	75.4 ab	35.0 e	4.97 de
BAYLETON 50WP	.250	6/10	39	11.7 bc	75.3 ab	36.5 b-e	5.15 b-e
TILT 250 EC	.125	6/10	39	7.9 bc	75.8 a	39.8 ab	5.29 a-d
BAYLETON 50WP	.125	6/10	39				
U BAYLETON 50WP	.125	7/1	68	18.5 abc	75.7 a	36.5 b-e	5.13 c-e
BAYLETON 50WP	.125	6/10	39				
U FOLICUR 1.2 EC	.125	7/1	68	12.8 abc	72.8 abc	39.5 abc	5.65 a
FOLICUR 1.2 EC	.125	6/10	39				
U FOLICUR 1.2 EC	.125	7/1	68	8.6 bc	70.4 c	41.0 a	5.61 a
BAYLETON 50WP	.125	6/10	39				
U TILT 250 EC	.125	7/1	68	9.6 bc	73.6 abc	35.0 de	5.49 abc
TILT 1.2 EC	.125	6/10	39				
U TILT 2.50 EC	.125	7/1	68	2.7 c	73.2 abc	40.3 a	5.55 ab

1. "U" refers to sequential application.

* Values in the same column which are followed by the same letter are not significantly different at the P = 0.05 level (Duncan's Multiple Range Test).

CROP: Spring Wheat, cv. Oslo

PEST: Septoria leaf spot, Septoria tritici

TITLE: EVALUATION OF TILT AND TILT PLUS MIXTURES FOR FOLIAR DISEASE CONTROL IN OSLO SPRING WHEAT.

MATERIALS: TILT (Propiconazole 25%) EC, DITHANE (mancozeb 80%) WP propiconazole mancozeb (commercial mix) 54.2% WP

NAME AND AGENCY:
WARKENTIN, T.D. AND WRIGHT, E.B.
ICMS (Integrated Crop Management Services), Inc.
P.O. Box 1351
Portage la Prairie, manitoba R1N 3N9

METHODS: Oslo spring wheat was seeded on May 25/87 at a rate of 168 kg/ha at Portage la Prairie, MB. Seed was placed to a depth of 4 cm in rows 19 cm apart using a Morris MH-310 hoe-press drill. Fertilizer was applied with the seed (28-26-0, 202 kg/ha) and topdressed on June 17/87 (34-0-0, 283 kg/ha). Plots were 3x7 m in size and were replicated 4 times in a randomized complete block design. Treatments were applied with a hand-held boom in a volume of 114 l/ha and a pressure of 275 kPa. Treatments 1, 3, and 4 were applied on July 8 when the wheat was at Zadok's stage 55; treatment 2 on July 13 at stage 60. Disease assessments were made on June 25 by randomly selecting 10 flag and 10 penultimate (2nd) leaves per plot and visually rating them for percent leaf area covered by tan spot and leaf rust. Assessments were adjusted using the Horsfall-Barratt scale. Yields were determined by harvesting the center 1.14 m of the plots using a Wintersteiger plot combine.

RESULTS: The results are summarized in the table below. One percent of the area of flag and penultimate leaves in the check were covered with leaf rust. All other treatments had none.

CONCLUSIONS: Environmental conditions were not conducive to severe disease infestation. All treatments significantly reduced the level of Septoria leaf spot on the flag and penultimate leaves of Oslo wheat. Applications of TILT at Zadok's stage 50 and 60 were equally effective. The TILT + DITHANE M-45 tank mix, as well as the propiconazole + mancozeb commercial mix, did not differ in effectiveness from each other or from the TILT treatments alone. Treatments did not produce significant increases in yield and thousand kernel weight. Fungicide treatments increased yields by 7-11%, however these increases were not significant at the 0.05 level. Disease infestations in this experiment became substantial only later in the season. This may explain the lack of yield increase despite the presence of disease control efficacy.

Treatment	Rate (g ai/ha)	Stage Zadok's	% Diseased area tan spot flag	% Diseased area tan spot 2nd	1000 kwt (g)	Yield (g/m^2)
1. TILT	0.125	50	9.0 b*	12.5 b	32.3 ab	347
2. TILT	0.125	60	7.3 b	17.8 b	33.3 a	338
3. TILT + DITHANE M-45	0.125 1.5	50	10.8 b	21.0 b	33.6 a	334
4. Propiconazole + Mancozeb	1.63	50	10.3 b	20.3 b	33.8 a	343
5. Check	-	-	19.8 a	55.5 a	31.1 b	313

*Values within a column followed by the same letter are not significantly different at the 5% level (Duncan's Multiple Range Test).

CROP: Spring Wheat, cv. HY 320

PEST: Septoria leaf spot, Septoria tritici
Leaf rust, Puccinia recondita

TITLE: EVALUATION OF SPOTLESS FOR CONTROL OF LEAF DISEASES IN SPRING WHEAT.

NAME AND AGENCY:
WARKENTIN, T.D. and WRIGHT, E.B.
ICMS (Intergrated Crop Management Services), Inc.
P.O. Box 1351
Portage la Prairie, Manitoba R1N 3N9

MATERIALS: SPOTLESS (25%) WP, DITHANE M-45 (mancozeb 80%) WP, ASSIST oil concentrate.

METHODS: HY 320 spring wheat was seeded on May 19/87 at a rate of 168 kg/ha at Portage la Prairie, MB. Seed was placed to a depth of 4 cm in rows 19 cm apart using a Morris MH-310 hoe-press drill. Fertilizer was applied with the seed (23-24-0, 202 kg/ha) and topdressed on June 17/87 (34-0-0, 283 kg/ha). Plots were 3x7 m in size and were replicated 4 times in a randomized complete block design. Treatments were applied with a hand-held boom in a volume of 114 l/ha and a pressure of 275 kPa on June 30 (treatments 1 and 2) and July 7 (treatments 3-9 and 1-2 (second application). Wheat was at Zadok's stage 39 on June 30 and 51 on July 17. Disease assessments were made on August 4 by randomly selecting 5 flag and 5 penultimate (2nd) leaves per plot and visually rating them for percent leaf area covered by Septoria leaf spot and leaf rust. Assessments were adjusted using the Horsfall-Barratt scale. Yields were determined by harvesting the center 1.14 m of the plots using a Wintersteiger plot combine.

RESULTS: The results are summarized in the table below. Only a slight amount of leaf rust was present in this experiment. It appeared in the untreated check at levels less than one percent.

CONCLUSIONS: All treatments significantly reduced the level of Septoria leaf spot on the flag and penultimate leaves and significantly increased wheat yields. Greatest yields occurred in treatments that received either: double application of SPOTLESS, a single application at 0.12 kg ai/ha, or SPOTLESS treatments in combination with DITHANE M-45. The addition of ASSIST oil concentrate did not affect SPOTLESS efficacy. None of the treatments significantly increased 1000 kernel weight.

Treatment	Rate (g ai/ha)	% Diseased area Septoria leaf spot flag	2nd	Yield ($g.m^2$)
1. SPOTLESS + ASSIST	0.06[1]	4.0 c[2]	15.0 cde	440 abc
2. SPOTLESS + ASSIST	0.12[1]	4.4 bc	6.6 e	461 a
3. SPOTLESS + ASSIST	0.06	6.1 bc	30.9 bc	426 bc
4. SPOTLESS + ASSIST	0.12	5.6 bc	11.4 cde	441 abc
5. SPOTLESS	0.06	5.9 bc	32.1 bc	423 bc
6. SPOTLESS	0.12	6.9 bc	14.9 cde	430 abc
7. SPOTLESS + DITHANE M-45	0.06 + 2.25	11.9 b	28.3 bcd	435 abc
8. SPOTLESS + DITHANE M-45	0.12 + 2.25	4.0 c	8.1 de	448 ab
9. DITHANE M-45	2.25	10.3 bc	37.6 b	409 c
10. Check	-	34.3 a	69.6 a	378 d

[1]Two applications (see above).

[2]Values within a column followed by the same letter are not significantly different at the 5% level (Duncan's Multiple Range Test).

CROP: Spring Wheat, c.v. Fielder

PEST: Septoria spp.

TITLE: SEPTORIA CONTROL IN IRRIGATED SOFT WHITE SPRING WHEAT FROM FOLIAR APPLICATIONS OF TILT.

MATERIALS: TILT (propiconazole, 250 EC), BAYLETON (triadimenol, 50 WP).

METHODS: Fielder Soft White Spring Wheat was planted on March 30, 1986 in 17 cm rows, 3.75 cm depth at a seeding rate of 170 kg/ha at Bow Island, Alberta. A total of 195 kg/ha of actual nitrogen was applied to the field. Of this total, 125 kg/ha was deep banded into the soil, 30 kg was applied at time of seeding, and the remainder was applied through a pivot irrigation system. Treatments were applied using a hand held CO_2 boom sprayer, delivering 100 l/ha through 8001 tee-jet flat fan nozzles. All plots were 4 x 8m in size of which 2 x 8m were actually sprayed. Treatments were applied at Zadok's G.S. 37, G.S. 50-55, or twice at both timings. G.S. 37 occurred on June 12 and G.S. 50-55 occurred on June 17, 1986. Disease assessments were taken 5 weeks after Zadok's G.S. 50-55. The flag and second leaf of ten randomly chosen tillers per plot were rated for Septoria spp. using the Horsfall-Barratt system. Yields were taken on August 10, 1986 using a Hege small plot combine which harvested an area of 9.6 m^2.

NAME AND AGENCY:

WILLICK, J.L. and E.L. MATTHEW
Ciba-Geigy Canada, Ltd.
820 - 26 St., N.E.
Calgary, Alberta
T2A 2M4

RESULTS: Disease and yield response are presented in the table below.

CONCLUSIONS: TILT significantly controlled disease and resulted in significant yield response when applied once, at Zadok's G.S. 37, or 50-55, or twice at both of these timings. Two applications of TILT did not significantly improve disease control, or result in a greater yield response over one application.

TREATMENT AND RATE (g ai/ha)	TIMING (Zadok's)	PERCENT SEPTORIA Flag	PERCENT SEPTORIA 2nd	YIELD (kg/ha)
Control	-	11.0 a	51.0 a	6938 b
TILT	37	5.0 b	19.0 bc	8218 a
TILT	50-55	5.0 b	11.0 c	8285 a
TILT (2x)	37/50-55	4.0 b	7.0 c	8285 a
BAYLETON	50-55	8.0 ab	29.0 b	7747 ab

* Values in the same column which are followed by the same letter are not significantly different at a 0.05 level of probability.

CROP: Spring Wheat, c.v. Fielder

PEST: Stripe Rust, Puccinia Striiformis

TITLE: STRIPE RUST CONTROL ON IRRIGATED SOFT WHITE SPRING WHEAT FROM FOLIAR APPLICATIONS OF TILT.

MATERIALS: TILT (propiconazole, 250 EC)
BAYLETON (triadimenol, 50 WP).

METHODS: Fielder soft white spring wheat was planted on May 13, 1986 in 17 cm rows, 5 cm depth, at a seeding rate of 120 kg/ha at Coaldale, Alberta. A total of 30 kg/ha of actual nitrogen was applied to the field. In addition, 70 kg/ha of nitrogen was found to already exist in the soil just before planting. Irrigation was by means of a wheel move sprinkler and water was applied every seven days. Treatments were applied using a hand held CO_2 boom sprayer, delivering 100 l/ha through 8001 tee-jet flat fan nozzles. All plots were 4 x 8m in size of which 2 x 8m were actually sprayed. Treatments were applied at Zadok's G.S. 37, G.S. 50-55, or twice at both timings. G.S. 37 occurred on July 4, 1986 and G.S. 50-55 occurred on July 10. Disease assessments were taken 3 weeks after Zadok's G.S. 50-55. The flag and second leaf of ten randomly chosen tillers per plot were rated for Stripe Rust using the Horsfall-Barratt system. Yields were taken on Sept. 2, 1986 using a Hege Small plot combine which harvested an area of 9.6 m2 per plot.

NAME AND AGENCY:
WILLICK J.L. and E.L. MATTHEW
Ciba-Geigy Canada Ltd.
820 - 26 Street, N.E.
Calgary, Alberta
T2A 2M4

RESULTS: Disease and yield responses are presented in the table below.

CONCLUSIONS: All treatments of TILT AND BAYLETON significantly controlled Stripe Rust and resulted in significant yield and 1,000 kwt responses. The only exception to this was when TILT was applied at Zadok's G.S. 37. This application, although providing good Stripe Rust control, did not provide a resultant response in yield and 1,000 kwt. This may have been due to a much earlier than required appliation, particularly since Stripe Rust occurred well after G.S. 50-55.

TREATMENT AND RATE (g ai/ha)		TIMING (Zadok's)	PERCENT STRIPE RUST Flag	PERCENT STRIPE RUST 2nd	YIELD (kg/ha)	1000 kwt (g)
Control		-	34.2 a	61.4 a	4266 de	31.7 de
TILT	125	37	14.6 b	8.9 b	4952 bcd	33.1 bcd
TILT	125	50-55	2.5 b	11.7 b	5443 ab	36.4 a
TILT (2x)	125	37/50-55	2.5 b	3.1 b	5681 a	36.1 ab
BAYLETON	125	50-55	3.3 b	6.1 b	5395 ab	35.0 abc

* Values in the same column which are followed by the same letter are not significantly different at a 0.05 level of probability.

CULTURE: Blé de printemps, C.V. Max.

ENNEMIS: Taches foliaires (Pyrenophora tritici-repentis, Septoria nodorum) blanc (Erysiphe graminis), rouille des feuilles (Puccinia recondita).

TITRE: EVALUATION DE FONGICIDES SUR LES MALADIES FOLIAIRES D'UN BLE DE PANIFICATION EN REGIE INTEGREE.

NOMS ET ORGANISME:
DEVAUX, A. et BRODEUR, J.
Service de recherche en phytotechnie
M.A.P.A.Q.
SAINT-HYACINTHE, Québec J2S 7B8

PRODUITS: BAYLETON 50W (triadimefon), BENLATE 50W (benomyl), BRAVO 500 (chlorothalonil), DITHANE M-45 (mancozèbe), FOLICUR 1.2 EC (éthyltrianol), MERTECT LSP 45F (thiabendazole 45%), MISTRAL WV (fenpropimorph 75%, RH 3866 240 E (myclobutanil), TILT 250 EC (propiconazole).

METHODE: On a semé un champ de blé Max à raison de 170 kg/ha avec un espacement de 10 cm entre les rangs le 22 avril. Après la levée on a délimité les parcelles (2 m x 10 m) et disposées en blocs aléatoires avec quatre répétitions. Au semis on a appliqué 123 kg/ha d'azote (46-0-0), une autre application de 246 kg/ha (34-0-0) au tallage et une troisième application de 83 kg/ha (34-0-0) au début épiaison. Le 18 juin entre les stades 41 et 45 de l'échelle de Zadoks et al on a appliqué du Cérone (833 ml/ha). Les fongicides ont été appliqués au stade 39 le 18 juin à raison de 300 l/ha au doses indiquées dans le tableau ci-dessous. Au cours de la saison on a évalué les maladies foliaires en utilisant une échelle de 0-9 et à maturité on a récolté l'ensemble des parcelles pour en determimés les rendements.

RESULTATS: Les résultats obtenus sont présentés dans le tableau ci-dessous. Comme on peut le constater, il n'y avait pas de maladies foliaires avant ou à l'épiaison. Les taches foliaires (Pyrenophora et Septoria) sont apparues sur les dernières feuilles seulement au stade 75 (grain mi-laiteux). Une sécheresse prolongé en juillet a causé l'échaudage précoce de plus de 10% des épis.

CONCLUSIONS: Le cultivar Max étant résistant au blanc on ne peut pas évaluer les fongicides contre cette maladie. Les taches foliaires et la rouille des feuilles sont apparues trop tard en saison pour affecter les rendements et trop tard après l'application des fongicides pour un contrôle efficace. Cependant, les deux traitements au mistral on significativement réduits la quantité de rouilles à cause de la deuxième application peu avant l'apparition de la maladie. Ceci confirme encore que l'apparition tardive des maladies foliaires ne réduisent pas le rendement du blé.

Fongicides et doses/ha	MALADIES (échelle 0-9)*						RENDEMENTS	
	Taches foliaires		Blanc		Rouilles			
	ZGS59**	ZGS75	ZGS59	ZGS75	ZGS59	ZGS75	Kg/ha	pds 1000gr.
Témoin (aucun traitements)	0	8.0 a***	0	0	0	3.9 ab	4566 a	28.8 a
Témoin (196 kg de N, 83 l Cerone)	0	7.9 a	0	0	0	4.7 ab	4196 a	30.4 a
BENLATE 50W 1 kg m.a.	0	8.1 a	0	0	0	3.3 ab	4094 a	29.1 a
DITHANE M-45 80% 2.25 kg	0	8.0 a	0	0	0	4.6 ab	4053 a	29.4 a
FOLICUR 1.2 EC 0.125 kg m.a.	0	7.8 a	0	0	0	5.9 ab	4003 a	29.5 a
BRAVO 500, 1 kg m.a.	0	7.7 a	0	0	0	4.8 ab	3982 a	30.3 a
TILT 250E, 0.125 kg m.a.	0	7.9 a	0	0	0	5.3 ab	3869 a	29.1 a
MERTECT 45%, 1.4 l m.a.	0	8.0 a	0	0	0	3.9 ab	3855 a	28.6 a
BAYLETON 50W, 0.125 kg m.a.	0	8.2 a	0	0	0	4.5 ab	3853 a	28.4 a
MISTRAL 75%, 0.75 kg m.a.	0	7.9 a	0	0	0	4.5 ab	3799 a	29.4 a
MISTRAL 75%, 0.75 kg m.a. + 2e application après 21 jours	0	7.8 a	0	0	0	0.2 c	3772 a	29.8 a
RH-3866 240 E, 0.2 kg m.a. + DITHANE m-45, 1.8 kg m.a.	0	7.6 a	0	0	0	6.3 a	3480 a	29.5 a

* 0= pas de taches, 1 à 3= léger à sévère sur feuilles du bas, 4 à 6= léger à sévère sur feuilles médianes, 7 à 9= léger à sévère sur dernières feuilles.
** Echelle de Zadoks et al
*** Les moyennes suivies de la même lettre ne sont pas significativement différentes (LSD-05)

CROP: Spring wheat, cv. Katepwa, Fielder

PEST: Naturally occurring foliar diseases

TITLE: EFFECT OF SEED TREATMENT FUNGICIDES ON EMERGENCE, PERCENT FOLIAR DISEASE AND YIELD ON IRRIGATED SPRING WHEAT

MATERIALS: AGROX FLOWABLE (maneb 250 g/L), Chipman; UBI 2100-2 (carbathiin 230 g/L), Uniroyal; UBI 2155 (carbathiin 26.7% and thiram 38.8%),Uniroyal; UBI 2454 (oxytane 100 g/L), Uniroyal; TF 3656 (triadimenol 75 g/L), Chipman; TF 3752 (flutriafol 12.5 g/L), Chipman.

METHODS: The experiment was done at the Irrigation Development Center, Outlook, Saskatchewan. Fertilizer was broadcast in the spring at 100 Kg/ha of 34-0-0. Irrigation water was applied during the growing season when tensiometer readings measured -0.5 bars. A split plot design was used with the main plots being the wheat cultivars Katepwa and Fielder while the sub-plots consisted of the various fungicide treatments and a control. Treatments were replicated four times. The fungicides were applied by first distributing the chemical on the inside surface of a 0.5 L glass jar, then adding 250 g of seed and finally, shaking for several minutes. Each plot consisted of four 6 m rows with 350 seeds planted per row. Seeding and fertilizing (40 kg/ha of 11-55-0) occurred on May 14. Emergence was recorded on June 14 in 2 m of the two center rows. Foliar disease ratings based on the Horsfall-Barrett scale were done on August 7 (early dough stage) by rating 10 randomly chosen penultimate leaves from the two center rows. Harvesting of 4 rows by 5 m long was done on September 15 with yield recorded as grams per plot.

NAME AND AGENCY:
KINDRACHUK, C.R., DUCZEK, L.J. and DZIADYK, D.A.
Research Station, Agriculture Canada
107 Science Crescent
Saskatoon, Saskatchewan
S7N 0X2
(This study was supported by the Saskatchewan Agriculture Development Fund, and the assistance by personnel at the Saskatchewan Irrigation Development Center, is gratefully acknowledged.)

RESULTS: The results are summarized in the table below. At the 0.05 level, emergence was significantly higher for Katepwa (180) than for Fielder (154) while yield was significantly higher for Fielder (1544) than for Katepwa (1339). Percent foliar disease was similar in both cultivars with levels being 46 and 45, respectively for Katepwa and Fielder. The cultivar by treatment interaction was not significant for emergence, foliar disease and yield and therefore the data for cultivars has been combined in the table. Determination of the causal agents of the foliar disease have yet to be done.

CONCLUSIONS: Emergence was significantly reduced (P=0.01) by three treatments (UBI 2454, TF 3656 and TF 3752 at 0.10 g a.i.) as compared to the control. This suggests a phytotoxic effect. The treatments did not exhibit any significant differences (P=0.01) for percent foliar disease nor for yield as compared to the control. Although not significant, the control had the highest level of foliar disease and nearly the lowest yield. UBI 2454 and TF 3656 had lower yields but these treatments also had the lowest emergence. Highest yields occurred with UBI 2100-2, UBI 2155, TF 3752 and Agrox Flowable. Lowest foliar disease occurred with TF 3752, TF 3656 and UBI 2454.

Treatment and Rate (g a.i./kg seed)		Emergence	Foliar Disease (%)	Yield (g)
Control		179 ab*	52 a	1404 a
Agrox Flowable	0.45	183 ab	49 a	1517 a
UBI 2100-2	0.55	173 abc	48 a	1538 a
UBI 2155	0.53 + 0.78	196 a	47 a	1527 a
UBI 2454	0.2	134 d	43 a	1299 a
TF 3656	0.2	149 cd	42 a	1311 a
TF 3752	0.05	169 bc	43 a	1416 a
TF 3752	0.10	152 cd	42 a	1518 a

* Values in the same column which are not followed by the same letter are significantly different at the 0.01 level of probability according to Duncan's Multiple Range Test.

CROP: Spring wheat, cv. Katepwa, Fielder

PEST: Naturally occurring foliar diseases

TITLE: EFFECT OF FOLIAR FUNGICIDE TREATMENTS ON FOLIAR DISEASE AND YIELD OF IRRIGATED SPRING WHEAT.

MATERIALS: TILT (propiconazole EC 250 g/L), Ciba Geigy; DITHANE M45 (mancozeb 80% WP), Rohm and Haas; BAYLETON (triadimefon 50% WP), Chemagro; HWG 1608 (EC 15%), Chemagro; SPORTAK (prochloraz EC 400 g/L), Elanco; BRAVO 500 (chlorothalonil 500 g/L), Biotech; POLYRAM DF (metiram 80% WP), BASF.

METHODS: The experiment was done at the Irrigation Development Center, Outlook, Saskatchewan. In the spring 34-0-0 was broadcast at a rate of 100 kg/ha and during the growing season, irrigation water was applied when tensiometer readings measured -0.5 bars. The treatments were replicated four times in a split plot design with the main plots being the cultivars and the subplots the treatments. Each subplot consisted of eight rows 6 m long and each row contained 350 seeds. Four rows of barley were planted between subplots. Seeding and fertilizing (40 kg/ha of 11-55-0) occurred on May 14. Fungicides were applied to the foliage of the 8 subplot rows with a hand-held, CO_2 pressurized, 4 nozzle boom sprayer (nozzle size 0.01) delivering 225 L/ha at 250 kPa. The rates applied are shown in the table except for Sportak where 250 ml/ha of Enhance was also added. Spraying occurred on June 26 (tillering stage), July 7 (inflorescence completely emerged to anthesis halfway) and July 15 (anthesis complete). Foliar disease ratings based on the Horsfall-Barrett scale were done on August 5 (soft dough) by rating 10 randomly selected flag leaves from the two center rows. Harvesting of 5 rows by 5 m long was done on September 15 with yield recorded as grams per plot.

NAME AND AGENCY:
KINDRACHUK, C.R., DUCZEK, L.J. and DZIADYK, D.A.
Research Station, Agriculture Canada
107 Science Crescent
Saskatoon, Saskatchewan
S7N 0X2
(This study was supported by the Saskatchewan Agriculture Development Fund, and the assistance by personnel at the Saskatchewan Irrigation Development Center, is gratefully acknowledged.)

RESULTS: The results are summarized in the table. The cultivars differed significantly (P=0.05) in foliar disease (Katepwa - 42, Fielder - 29) and in yield (Katepwa - 1887, Fielder - 2382). The cultivar by treatment interaction was not significant so the data for cultivars was combined in the table. The causal agents of the foliar disease have yet to be determined.

CONCLUSIONS: All of the treated plots had significantly (P=0.01) less foliar disease than the control. The three treatments with the lowest percent foliar disease were Tilt (3 sprays), HWG 1608 and Bravo 500. The control also had the lowest yield. Treatments with significantly (P=0.01) greater yield than the control in descending order were HWG 1608, Tilt - 3 sprays, Sportak, Bravo 400 and Polyram DF. The yield for HWG 1608 was significantly higher (P=0.01) than for all the other treatments, except for 3 sprays of Tilt. The yield increase over that of the control was 35% for HWG 1608 and 31% for 3 sprays of Tilt. The correlation coefficient ($r = -0.885$, $n = 9$) between foliar disease and yield was significant (P=0.01) and this indicates that as disease increases yield decreases.

Treatment and Rate (a.i./ha)		Spray schedule			Foliar Disease (%)	Yield
		June 26	July 7	July 15		
Control		spray	spray	spray	66 a*	1823 d
Tilt - 3 sprays	125 g	spray	spray	spray	19 f	2394 ab
Tilt - 1 spray	125 g	-	spray	-	30 de	2072 cd
Dithane M45	1.8 kg	-	spray	spray	42 bc	2044 cd
Bayleton	200 g	-	spray	spray	51 b	1944 cd
HWG 1608	125 g	-	spray	spray	19 f	2461 a
Sportak	400 g	-	spray	-	35 cd	2153 bc
Bravo	1.0 kg	-	spray	spray	21 ef	2149 bc
Polyram DF	1.8 kg	-	spray	spray	41 c	2142 bc

* Values in the same column which are not followed by the same letter are significantly different at the 0.01 level of probability according to Duncan's Multiple Range Test.

CROP: Spring Wheat, c.v. Fielder

PESTS: Septoria sp.
Tan Spot, Pyrenophora trichostoma
Powdery Mildew, Erysiphe graminis

TITLE: EFFICACY OF FOLIAR APPLIED FUNGICIDES ON DISEASES AND YIELD OF IRRIGATED SOFT WHITE WHEAT.

MATERIALS: TILT (propiconazole, 250 EC), DITHANE M-45 (mancozeb 80% WP), TILT/mancozeb(54.2% WP), BAYLETON (triadimenol, 50% WP).

METHODS: Fielder soft white spring wheat was planted on April 21, 1987 in 15 cm rows, 3.75 cm. depth, at a seeding rate of 148 kg/ha at Picture Butte, Alberta. A total of 68 kg/ha of actual nitrogen was applied to the field. In addition, 86 kg/ha of nitrogen was found to already exist in the soil just before planting. Irrigation was by means of a wheel move sprinkler and water was applied every seven days. Treatments were applied using a hand-held CO_2 boom sprayer, delivering 100 l/ha through 8001 tee-jet flat fan nozzles. All plots were 4 x 8 m in size of which 2 x 8 m were actually sprayed. All treatments were applied at Zadok's G.S. 50-55, except one treatment of TILT, which was applied at G.S. 60, and mancozeb, which was applied twice, once at G.S. 50-55 and secondly seven days later. G.S. 50-55 occurred on June 24, 1987, while G.S. 60 occurred on June 26, 1987. Disease assessments were taken 5 weeks after G.S. 50-55. The flag and second leaf of ten randomly chosen tillers per plot were rated for all diseases using the Horsfall-Barratt system. Yields were taken on August 31, 1987, using a Hege small plot combine which harvested an area of 9.6 m2 per plot.

NAME AND AGENCY:
WILLICK, J.L. and T.D. WALLACE
Ciba-Geigy Canada, Ltd.
820-26 Street, N.E.
Calgary, Alberta
T2A 2M4

RESULTS: Disease and yield response are presented in the table below.

CONCLUSIONS: TILT significantly controlled disease when applied at either Zadok's G.S. 50-55, or G.S. 60, although control was more significant than the check when TILT was applied at G.S. 50-55, particularly in regards to control on the second leaf. TILT alone, or in combination with mancozeb (tank mix, or pre-mix) at G.S. 50-55, and TILT applied at G.S. 60 significantly affected yield. BAYLETON and DITHANE M-45 significantly controlled disease, when compared to check, but not as significantly as an application of TILT at G.S. 50-55. BAYLETON and DITHANE M-45 did not result in significant yield responses.

TREATMENT AND RATE (g ai/ha)			TIMING (Zadok's)	PERCENT DISEASE flag	PERCENT DISEASE 2nd	YIELD (kg/ha)
Control			-	13.1 a	74.5 a	7,465 c
TILT	125		50-55	3.5 c	8.5 d	8,018 ab
TILT+ DITHANE M-45	125	+ 1500	50-55	3.7 c	20.7 cd	8,080 a
TILT/mancozeb	1630		50-55	4.7 c	29.2 c	8,085 a
TILT	125		60	4.6 c	24.5 c	7,925 ab
BAYLETON	125		50-55	4.9 c	29.2 c	7,748 abc
DITHANE M-45 (2x)	1800		+ 7 days later	8.0 b	48.0 b	7,605 bc

* Values in the same column which are followed by the same letter are not significantly different at a 05 level of probability.

CROP: Soft White Spring Wheat, cv. Fielder

PEST: Erysiphe graminis f.sp. tritici, Puccinia recondita and Alternaria alternata

TITLE: EVALUATION OF FUNGICIDES FOR THE CONTROL OF FOLIAR AND HEAD DISEASES OF SOFT WHITE SPRING WHEAT IN 1987

MATERIALS: BAYLETON (WP) (triadimefon 50%), DITHANE M-45 (WP) (mancozeb 80%), MISTRAL (EC) (fenpropimorph 75%), TILT (EC) (propiconazole 25%).

METHODS: Field plots (6 m x 1 m) of the variety Fielder were seeded on April 29 at Lethbridge, Alberta. All treatments were replicated five times and arranged in a randomized complete block design. At Zadoks growth stage 55, the fungicides were applied at the rates indicated in the table using a CO_2 sprayer. Three weeks after spraying, the percent leaf area covered by powdery mildew and leaf rust was visually assessed on the flag leaf of ten randomly selected plants. At maturity, the plots were trimmed to 5 m in length and the entire plot was harvested. The grain was dried for a week and then the yield and 1000-kernel weight were determined. Black point incidence was determined based on the percentage of black point kernels in a 200-kernel sample from each plot.

NAME AND AGENCY:

CONNER, R. L. and A. D. KUZYK
Agriculture Canada Research Station
P. O. Box 3000, Main
Lethbridge, Alberta
T1J 4B1

RESULTS: The results are summarized in the table below.

CONCLUSION: BAYLETON and TILT were very effective in controlling powdery mildew. MISTRAL and DITHANE M-45 provided less effective control of powdery mildew but were significantly better than the untreated check. All of the fungicides controlled leaf rust. Black point incidence was significantly higher in the TILT treatment in comparison to the untreated check. Black point incidence in the other fungicide treatments were similar to the untreated check. Yield reductions were only partially due to a decrease in kernel weight. The moderate powdery mildew resistance in Fielder appears to have been sufficient to prevent any serious reduction in yield.

Fungicide	Rate ai/ha	Powdery* mildew severity	Leaf* rust severity	Black point incidence	Yield (Kg/ha)	1000-Kernel weight (g)
Tilt	0.125 kg	7.0c**	0.8b	30.5a	7222a	52.1a
Bayleton	0.125 kg	5.0c	1.8b	25.7ab	7088a	51.9ab
Untreated	-	24.0a	7.0a	18.8b	6850ab	51.4abc
Mistral	0.75 L	14.0b	1.0b	24.2ab	6814ab	51.3bc
Dithane M-45	2.25 kg	17.0b	3.4b	19.3b	6606b	51.0c

*Powdery mildew and leaf rust severity recorded as percent leaf area covered according to Cobbe's Modified Scale.

**Column means followed by the same letter are not significantly different (P = 0.05), according to Duncan's Multiple Range Test.

CULTURE: blé d'automne, c.v. Frankenmuth

ENNEMIS: maladies du semis et du pied (Bipolaris Sorokiana, Fusarium sp, Rhizoctonia solani, etc...)

TITRE: EVALUATION DE FONGICIDES EN TRAITEMENT DE SEMENCE SUR LES MALADIES DU SEMIS ET DU PIED DANS LE BLE D'AUTOMNE.

NOMS ET ORGANISMES:
DEVAUX A., et BRODEUR J.
Service de recherche en phytotechnie
M.A.P.A.Q.
SAINT-HYACINTHE, Québec J2S 7B8

PRODUITS: AGROX N-M (maneb 50%), BAY-HWG-1608 1.2 EC (ethyltrianol), BENLATE 75 DF (benomyl), EL228 (nuarimol 5% FL), MERTECT LSP (thiabendazole 30%), PROCHLORAZ 400 g/l EC (Sportak), RH 3866 (myclobutanil 25%), TF 3479-B (triadiménol; Baytan), TF 3645 (nuarimol 3.3% FL), TF 3560 (maneb 25%, thiabendazole 1%), VITAFLO 280 (carbathin 26.9%; thirame 13.8%).

METHODE: On a traité les semences avec les fongicides aux doses indiquées dans le tableau ci-dessous. Après traitement le pourcentage de germination des grains a été déterminé en laboratoire dans du sol. On a ensemencé les parcelles en champ le 9 septembre suivant la méthode des blocs casualisés avec quatre répétitions, chaque parcelle étant constitué de 5 rangs, 6 m de long, de 18 cm entre les rangs et contenant 500 grains/rang. Avant le tallage on a évalué le pourcentage d'émergence des plantules/m^2 ainsi que le pourcentage de plantules atteintes de maladies. Au début de juin l'année suivante on a évalué le poucentage de tiges nécrosées dans chaque parcelle. A maturité on a récolté des épis pour déterminer le poids des 1 000 grains des parcelles.

RESULTATS: Les résultats obtenus sont résumés dans le tableau ci-dessous. On a pas calculé le rendement des parcelles à cause de la mortalité hivernale des plantes qui a détruit de 3.8% à 46.3% des plantes dans toutes les parcelles.

CONCLUSIONS: Aucun des fongicides n'a réduit le pouvoir germinatif des semences. Cependant, ils n'ont pas pour autant augmentés de façon significative le pourcentage d'émergence des plantules dans le champ. Il ne semble y avoir aucune correlation entre les pourcentages de tiges malades dans les parcelles traitées et le témoin non-traité. De plus, les rendements du poids des 1 000 grains étant non-significatifs par rapport au témoin, on ne peut évaluer les fongicides à l'essai.

	SEMIS: % émergence		% tiges malades*			Rendements
Fongicides et doses par kg de semences	Lab	champ	B+F	R	P	Pds des milles grains
TF 3560, 1.73 ml	93	64.3 a**	1.2	1.2	0	36.7 a
BENLATE 75D, 1.3 g	95	61.3 a	1.0	11.2	4.9	36.6 a
TF-3479 B, 2.0 ml	95	61.0 a	0	9.0	0	37.5 a
EL-228, 1.5 ml	92	59.8 ab	3.5	9.8	0	37.7 a
Témoin (non-traité)	97	57.3 ab.	1.8	1.8	0	38.4 a
BAY-HWG-1608, 12.0 ml	77	55.0 ab	11.7	11.7	0	40.5 a
RH 3866, 2.5 ml	93	54.8 ab	18.8	0	0	38.7 a
TF 3645, 2.3 ml	93	54.0 ab	0.7	1.4	0	35.7 a
MERTECT LSP, 30% 25.7 ml	89	53.8 ab	0	6.0	0	41.1 a
VITAFLO 280, 1.6 ml	90	53.3 ab	3.2	6.6	0	37.9 a
PROCHLORAZ, 0.6 ml	92	51.8 ab	0	30.4	0	37.6 a
AGROX N-M , 1.2 g	94	51.3 ab	2.9	2.9	0	36.3 a
BAY-HWG-1608, 8.0 ml	78	46.5 ab	5.1	7.3	1.1	38.8 a

* B+F= nécroses de la base des tiges causées par Bipolaris ou Fusarium
R= nécroses du à Rhizoctonia (rhizoctone ocellé)
P= piétin échaudage.

** les moyennes suivies de la même lettre ne sont pas significativement différentes (LSD-05)

CULTURE: Blé d'automne, C.V. Frankenmuth

ENNEMI: Taches foliaires (Pyrenophora tritici-repentis, Septoria nodurun), blanc (Erysiphe graminis), rouille des feuilles (Puccinia recondita).

TITRE: EVALUATION DE FONGICIDES SUR LES MALADIES FOLIAIRES EN REGIE INTEGREE

NOMS ET ORGANISME:
DEVAUX, A. et BRODEUR, J.
Service de recherche en phytotechnie
M.A.P.A.Q.
SAINT-HYACINTHE, Québec J2S 7B8

PRODUITS: Bayleton 50 WP (triadimefon), Dithane M-45 (mancozèbe), Folicur 1.2 EC (ethyltrianol), Tilt 250 EC (propiconazole).

METHODE: On a semé un champ de blé à raison de 170 kg/ha avec un espacement de 18 cm entre les rangs. Après la levée on a étendu de la paille de blé dans le champ comme source d'inoculum du Pyrenophora. Au printemps on a délimité les parcelles (2 m X 10 m) et disposées en blocs aléatoires avec quatre répétitions. Au dégel (le 14 avril) on a appliqué 112 kg/ha d'azote (34-0-0) et une autre application de 84 kg/ha au stade premier noeud (le 7 mai). Au stade de la feuille étandard on a appliqué du Cérone (833 ml/ha). Les fongicides ont été appliqués à raison de 300 l/ha après la formation du premier noeud (stade 31 de l'échelle de Zadoks) le 8 mai aux doses indiquées dans le tableau ci-dessous. Au cours de la saison on a évalué les maladies foliaires en utilisant une échelle de 0-9 (voir tableau ci-dessous). A maturité on a récolté l'ensemble des parcelles pour en déterminer les rendements.

RESULTATS: Les résultats sont présentés dans le tableau ci-dessous. Comme on peut le constater il n'y avait que des traces de maladies avant l'épiaison. Au stade grain laiteux elles affectaient surtout les feuilles du bas et les feuilles médianes, les dernières feuilles étant très peu affectées. La rouille des feuilles s'est manifestée de façon significative seulement en fin de saison (stade grain pateux) sur les dernières feuilles.

CONCLUSION: L'apport d'azote a augmenté la sensibilité des plantes au blanc et à la rouille, mais pas aux taches foliaires (Pyrenophora et Septoria). Aucun des traitements étaient efficaces contre les taches foliaires et la rouille, par contre tous les produits sauf Dithane M-45 ont réduit le pourcentage de blanc. Aucun des traitements n'a augmenté les rendements (kg/ha) et le poids des 1000 grains. Ces résultats confirment ceux obtenus les années antérieures sur le blé de printemps à savoir que les maladies foliaires affectent peu le rendement du blé lorsque leur intensité est faible avant l'épiaison.

	MALADIES (échelle de 0-9) *						RENDEMENTS	
Fongicides et doses/ha	Taches foliaires		Blanc		Rouille			
	ZGS 47**	ZGS73	ZGS47	ZGS73	ZGS47	ZGS85	kg/ha	Pds 1000 gr.
Témoin (196 kg de N, .83 l. cycocel)	0.1 a ***	6.4 a	2.3 a	6.5 a	3.5 a	7.0 a	5256 a	34.8 a
Tilt 0.125 kg m.a.	0 a	5.3 a	0	3.4 a	1.4 a	7.0 a	5160 a	34.5 a
Folicur 0.125 kg m.a.	0 a	6.2 a	0.9 bc	5.3 a	2.3 a	7.0 a	5160 a	34.0 a
Bayleton 50W 0.125 kg m.a.	0 a	5.3 a	0.2 c	4.9 a	1.5 a	7.1 a	5115 a	34.7 a
Témoin (aucun traitement)	0.4 a	6.3 a	1.2 b	4.7 a	1.5 a	7.0 a	4736 a	35.2 a
Dithane M-45 2.25 kg	0 a	6.2 a	1.3 b	6.1 a	1.8 a	7.2 a	4436 a	33.0 a

* 0 = pas de taches, 1 à 3 = léger à sévère sur feuilles du bas, 4 à 6 = léger à sévère sur feuilles médianes, 7 à 9 = léger à sévère sur les feuilles du haut.

** échelle de Zadoks et al.

*** Les moyennes suivies de la même lettre ne sont pas significativement différentes (LSD .05)

CROP: Winter wheat, cv. Norstar

PEST: Leaf rust Puccinia recondita
Tan spot Pyrenophora tritici-repentis
Leaf blotches Septoria spp.

TITLE: EVALUATION OF LATE APPLICATIONS OF TILT AND DITHANE M-45 FOR BROAD SPECTRUM DISEASE CONTROL IN WINTER WHEAT.

NAME AND AGENCY:
ROURKE, D.R.S. , DOELL, R.J.
Ag-Quest
Independent Agricultural Research Services
Box 144
Minto, Manitoba ROK 1MO

MATERIALS: TILT (propiconazole 250 g/L EC)
DITHANE M-45 (mancozeb 80% WP)
TILT-MANCOZEB FORMULATED MIXTURE (propiconazole 4.2%, mancozeb 50% WP).

METHODS: Norstar winter wheat was seeded at Minto, Manitoba on Sept.3, 1986 at a rate of 300 seeds/m2 in 19.5 cm rows. 40 kg/ha P2O5 and 24 kg/ha K2O were applied with the seed. 80 kg/ha N as ammonium nitrate was broadcast April 21. Weeds were controlled with an application of Estaprop at 1.75 L/ha on May 11. Fungicides were applied with a compressed air bicycle sprayer delivering a volume of 110 L/ha at a pressure of 275 kPa. Treatments 2,4 and 5 were applied June 8 at 18C when the wheat was at Zadoks 50. Treatment 3 was applied June 16 at 25C when the wheat was at Zadoks 60. Rainfall 1 week after treatment was 15 and 16 mm respectively. There was a trace of tan spot on the lower leaves at the time of spraying. Diseases were evaluated July 10 using a 0-9 scale in which 0 is disease-free and 9 is greater than 50% on all leaves. Plots were harvested July 28 and grain yields were adjusted to 14.5% moisture.

RESULTS: Results are summarized in the table below.

CONCLUSIONS: The effects of foliar diseases were minimal due to dry weather and early crop maturity. Fungicide application resulted in a reduction in disease only in the case of leaf rust, and then only with the late application of Tilt or the Tilt/Dithane combinations. There were no significant differences in yield between any of the fungicide treatments and the untreated check. All fungicide treatments increased thousand kernal weight (TKW), although only the Tilt-Dithane tank mix resulted in TKW greater than the untreated check.

Table 1. Disease Control with Tilt and Dithane M-45[a]

Treatment	Rate kg/ha	Growth Stage	Lf Rust 0-9[b]	TS/Septoria 0-9	Yield kg/ha	Kern.Wt. Gm/1000
1. Check			5.8a	6.0a	3986a	32.6b
2. Tilt	.125	50	5.5a	6.0a	4050a	34.0b
3. Tilt	.125	60	5.0b	5.8a	3961a	33.3ab
4. Tilt+Dithane	.125+1.5	50	5.0b	5.8a	3975a	34.7a
5. Tilt/Man form.	1.62	50	5.0b	6.0a	3828a	32.9ab

[a] Values in the same column which are followed by the same letter do not differ significantly at the 5% level (Duncan's MRT).

b Disease rating scale - a modification of Horsfall-Barratt according to Luc Couture.

CROP: Winter wheat, cv. Norstar

PEST: Leaf rust Puccinia recondita
Tan spot Pyrenophora tritici-repentis
Leaf blotches Septoria spp.

TITLE: CONTROL OF FOLIAR DISEASES IN NORSTAR WINTER WHEAT GROWN AT FOUR PLANT DENSITIES.

MATERIALS: TILT (propiconazole 250 g/L EC)
DITHANE M-45 (mancozeb 80% WP)

METHODS: Norstar winter wheat was seeded into standing barley stubble near Minto, Manitoba on Sept.3, 1986 at rates of 300 and 500 seeds/m2 in combination with row spacings of 9 and 18 cm. 50 kg/ha P2O5 and 30 kg/ha K2O were applied with the seed. 80 kg/ha of N as ammonium nitrate was broadcast April 15 and an additional 40 kg/ha N was broadcast May 15 at ZGS 31. Weeds were controlled with an application of Estaprop at 1.75 L/ha on May 11. Fungicides were applied using a compressed air bicycle sprayer delivering a volume of 110 L/ha at a pressure of 275 kPa. Initial application of both Tilt and Dithane were made June 8 at 18C when the crop was at Zadoks 50-55. The second application of Dithane was made June 16 at 30C when the crop was at Zadoks 75. Rainfall 1 week after treatment was 8, 22, and 8 mm respectively. Disease levels in the plots were assessed on July 10 using a scale of 0-9 in which 0 is disease-free and 9 is greater than 50% leaf area infected on all leaves. Plots were harvested July 27 and grain yields were adjusted to 14.5% moisture.

NAME AND AGENCY:
ROURKE, D.R.S. , DOELL, R.J.
Ag-Quest
Independent Agricultural Research Services
Box 144
MINTO, Manitoba ROK 1MO

RESULTS: The main fungicide effects are presented in the table below. The main effects of row-spacing and seeding rate were non-significant.

CONCLUSIONS: All fungicide treatments reduced the levels of leaf rust, but had no effect on levels of tan spot/septoria. Application of Tilt reduced plant height, with the double application resulting in a significant reduction in height compared to the untreated check. Tilt had the same effect on the number of heads/m2. The untreated check was the highest yielding treatment, although not significantly different from the Dithane treatment. Both Tilt treatments resulted in yields significantly lower than either the check or the Dithane treated plots. Hot dry weather in May and June hastened crop maturity and reduced the spread of,and effect of,diseases, thus minimizing the effect of fungicides. Thousand kernal weights were also lower for plots treated with Tilt, although differences were not significant.

Table 1. Disease Control in Norstar Wheat

Treatment	Rate kg/ha	Growth Stage	Lf Rust 0-9 [a]	TS/Sept 0-9	Pl/m2 Apr	Plant Ht.cm	Heads /m2	Yield kg/ha	Kern.Wt. Gm/1000
1. Check			7.0	6.0	238	74	532	4036	32.6
2. Dithane	1.6	50/60	5.5	6.0	238	74	531	3924	32.2
3. Tilt	.125	50	5.8	6.0	238	70	503	3230	31.3
4. 2x Tilt	.125/.125	50/75	5.2	5.9	225	63	447	2978	29.1
LSD (.05)					19	8	66	678	3.3

a Disease rating scale - a modification of Horsfall-Barratt according to Luc Couture.

CROP: Winter wheat, cv. Norstar

PEST: Leaf rust Puccinia recondita
Tan spot Pyrenophora tritici-repentis
Leaf blotches Septoria spp.

TITLE: EFFICACY OF TILT APPLICATION TECHNIQUES ON NORSTAR WINTER WHEAT.

NAME AND AGENCY:
ROURKE, D.R.S., DOELL, R.J.
Ag-Quest
Independent Agricultural Research Services
Box 144
MINTO, Manitoba ROK 1MO

MATERIALS: TILT (propiconazole 250 g/L EC)

METHODS: Norstar winter wheat was seeded at Minto, Manitoba on Sept.3, 1986 at a rate of 300 seeds/m2 in 19.5 cm rows. 40 kg/ha P2O5 and 24 kg/ha K2O were applied with the seed. 80 kg/ha N as ammonium nitrate was broadcast April 21. Weeds were controlled with an application of Estaprop at 1.75 L/ha on May 11. Fungicides were applied on June8 with a compressed air bicycle sprayer. The temperature at spraying was 18C and rainfall 1 week after treatment was 8 mm. The wheat was at Zadoks 50-55 and there was a trace of tan spot on the lower leaves at the time of spraying. Tilt was applied at a rate of .125 kg/ha on all treatments. Disease levels were evaluated July 10 using a 0 (disease free) to 9 (greater than 50% of leaf area infected) scale. Plots were harvested July 28 and yields were adjusted to 14.5% moisture.

RESULTS: Results are summarized in the table below.

CONCLUSIONS: Low levels of disease on the 1987 winter wheat crop made evaluation of fungicide application methods difficult. None of the application methods resulted in significant reductions of leaf rust. All methods of application reduced tan spot/septoria, but there were no significant differences in disease levels between treatments. There were also no significant differences in yield. The untreated check had the second highest yield after the 100 L/ha, 275 kPa, 90 degree tilt application. There were no differences in TKW.

Table 1. Tilt Application Technique Results[a]

Tmt	Volume	Nozzle Angle	Pressure kPa	Lf Rust 0-9c	TS/Septoria 0-9	Yield Kg/ha	Kern.Wt. Gm/1000
1.	Check			5.8a	7.3a	4846a	33.9a
2.	100 L/ha	90	275	5.8a	6.3b	4921a	35.4a
3.	200 L/ha	90	275	5.8a	6.3b	4489a	33.9a
4.	100 L/ha	90	550	5.3a	6.3b	4400a	34.0a
5.	200 L/ha	90	550	5.3a	6.3b	4532a	33.6a
6.	100 L/ha	45	275	5.3a	6.0b	4626a	34.6a
7.	200 L-CT[b]	20	275	5.3a	6.5b	4729a	35.6a

[a] Values in the same column which are followed by the same letter do not differ significantly at the 5% level (Duncan's Multiple Range Test).
b CROP TILTER (CT) is a devise fastened 10 cm ahead of the spray boom which bends the crop ahead of the boom, allowing better spray penetration into the crop canopy. The crop tilter was adjusted to operate 15 cm below the top of the crop. Nozzles were angled 20 degrees back.
c Disease rating scale - a modification of Horsfall-Barratt according to Luc Couture.

CROP: Winter wheat, cv. Norwin

PEST: Leaf rust Puccinia recondita
Tan spot Pyrenophora tritici-repentis
Leag blotches Septoria spp.

TITLE: CONTROL OF FOLIAR DISEASES IN NORWIN WINTER WHEAT GROWN AT FOUR PLANT DENSITIES.

MATERIALS: TILT (propiconazole 250 g/L EC)
DITHANE M-45 (mancozeb 80% WP)

METHODS: Norwin winter wheat was seeded into standing barley stubble near Minto, Manitoba on August 30, 1986 at rates of 200, 300, 400 and 500 seeds/m2 and a row spacing of 18 cm. 60 kg/ha P205 and 30 kg/ha K2O were banded with the seed. 80 kg/ha N as ammonium nitrate was broad cast April 15 and an additional 40 kg/ha N was broadcast May 14. Weeds were controlled with Estaprop at 1.75 L/ha on May 11. Fungicides were applied using a compressed air bicycle sprayer delivering a volume of 110 L/ha at a pressure of 275 kPa. Initial applications of Tilt and Dithane were made June 4 at 15C when the wheat was at Zadoks 50-55. The second Dithane application was made June 11 at 20C when the wheat was at Zadoks 60. The second Tilt application was made June 24 (tmt.4 only) at 12C when the wheat was at Zadoks 75. There was a trace of tan spot on the lower leaves at the time of spraying. Disease levels were assessed on June 24 using a scale of 0-9 in which 0 is disease-free and 9 is greater than 50% leaf area infected on all leaves. There was no evidence of leaf rust in the experiment. Plots were harvested July 28 and yields were adjusted to 14.5% moisture.

NAME AND AGENCY:
ROURKE, D.R.S. , DOELL, R.J.
Ag-Quest
Independent Agricultural Research Services
Box 144
MINTO, Manitoba ROK 1MO

RESULTS: The main fungicide results are presented in the table below. The main effects of seeding rate were non-significant.

CONCLUSIONS: Fungicides tested had no visual effect on the levels of tan spot/septoria according to the June 24 rating. Application of Tilt resulted in a significant increase in plant height compared to the untreated check and the Dithane treatment. Dithane appeared to reduce heads/m2 although the reduction was not significant compared to the other treatments. All fungicide treatments increased yield. The greatest increase of over 500 kg/ha for the single Tilt application was significantly more than the untreated check. Hot dry weather in May and June hastened crop maturity and thereby reduced diseases on the plant, minimizing the fungicide effects. Thousand kernal weights were also significantly increased by fungicide application.

Table 1. Disease Control in Norwin Wheat

Treatment	Rate kg/ha	Growth Stage	TS/Septoria 0-9 [a]	Plant Ht.cm	Heads /m2	Yield kg/ha	Kern.Wt. Gm/1000
1. Check			5.0	49	685	3553	30.5
2. Dithane M-45	1.6	50/60	5.0	50	639	3712	31.1
3. Tilt	.125	50	4.9	53	671	4122	33.5
4. 2x Tilt	.125/.125	50/75	5.0	52	682	3941	32.9
LSD (.05)			0.1	1	43	427	0.9

a Disease rating scale - a modification of Horsfall-Barratt according to Luc Couture.

CROP: Winter wheat cv. Augusta

PEST: Powdery mildew, Erisiphe graminis f.sp. tritici, Septoria nodorum blotch, Phaeosphaeria nodorum, Leaf rust, Puccinia recondita, Stem rust, Puccinia graminis f.sp. tritici.

TITLE: CONTROL OF FOLIAR DISEASES IN AUGUSTA WINTER WHEAT.

NAME AND AGENCY:
BLYDORP, L.J., DENTZ, C.B. and TOLTON, D.A.
Chemagro Limited 256 Britannia Road East
Mississauga, Ontario, L4Z 1S6

MATERIALS: BAYLETON 50 WP (triadimefon), FOLICUR 45 DF (ethyltrianol), FOLICUR 1.2 EC (144 g ai/L ethyltrianol) TILT 250 EC (propiconazole).

METHODS: Wheat was planted on October 16, 1986, in 17.8 cm rows at a rate of 135 kg/ha with a conventional grain drill in a sandy loam soil near Wingham, Ontario. Plots were 2.0 m wide, 7.0 m long and replicated 4 times in a randomized complete block design. P and K were applied according to soil test. 108 kg N/ha was spring applied. Early fungicide applications were made at first sign of disease on May 16 at Zadok's Growth Stage (ZGS 32) and late applications were made on June 10 at ZGS 55. Treatments were applied with a CO_2 powered back pack sprayer delivering 200 L/ha through 8002 teejet flat fan nozzles at 200 kPa. Disease was evaluated by assessing the third leaf on June 8 at ZGS 53, the penultimate leaf on June 25 at ZGS 80 and the flag leaf, stem and head on July 8 at ZGS 85. Percent diseased tissue was visually estimated of five plants per plot. Yields were taken on July 30 by harvesting a 1.3 m strip down the centre of each plot using an Almaco small plot combine.

RESULTS: The results are summarized in the table below. Powdery mildew developed during late tillering following by Septoria with leaf and stem rust developing later in the season. BAYLETON gave the best control of powdery mildew while TILT and FOLICUR were slightly less, but not significantly less effective. Best control of Septoria was attained with FOLICUR and TILT followed by BAYLETON. Most treatments yielded significantly higher than the check. Double application treatments tended to yield higher than single application treatments. Hectolitre weights and thousand kernel weights (1000 kwt) were tested but are not presented because significant differences were not observed.

CONCLUSIONS: All fungicide treatments reduced foliar, stem and head diseasses significantly in comparison to the check. Double application treatments provided better disease control and tended to give higher yields than single application treatments.

TREATMENT[1]	RATE (kg ai/ha)	APPL ZGS	% POWDERY MILDEW 3rd Leaf 6/8 ZGS 53	% SEPTORIA 2nd Leaf 6/25 ZGS 80	% DISEASE - 7/8;ZGS 85 Flag Leaf Powdery Mildew	Flag Leaf Septoria	Flag Leaf Leaf Rust	Stem Stem Rust	Head Septoria Glume Blotch	YIELD (t/ha)
CONTROL	-	-	18.8 a*	38.9 a	12.1 a	50.3 a	5.1 a	8.9 a	29.5 a	4.08 f
FOLICUR 45 DF	.125	32;55	5.9 cd	15.0 b	1.2 c	10.7 def	0.0 b	0.1 b	7.6 def	4.87 b-e
FOLICUR 1.2 EC	.125	32;55	5.8 cd	9.9 b	1.4 c	7.3 def	0.0 b	0.0 b	6.1 ef	5.03 a-e
FOLICUR 1.2 EC	.188	32;55	2.9 cd	12.2 b	1.2 c	4.4 ef	0.1 b	0.0 b	5.1 ef	5.21 a-d
FOLICUR 1.2 EC	.250	32;55	3.3 cd	14.5 b	0.4 c	3.1 f	0.0 b	0.0 b	2.7 f	5.65 a
BAYLETON 50 WP	.125	32;55	1.4 cd	11.0 b	0.3 c	19.0 b-e	0.8 b	0.5 b	17.2 bc	5.43 a-c
BAYLETON 50 WP	.188	32;55	0.8 d	18.8 b	0.4 c	16.6 c-f	0.4 b	0.7 b	9.1 c-f	5.35 a-c
BAYLETON 50 WP	.250	32;55	0.4 d	12.0 b	0.5 c	20.2 bde	0.6 b	0.5 b	9.6 c-f	5.37 a-c
TILT 250 EC	.125	32;55	2.1 cd	6.5 b	0.5 c	8.0 def	0.6 b	0.7 b	5.1 ef	5.59 ab
BAYLETON 50 WP	.125	32	2.2 cd	14.6 b	2.2 c	31.3 b	3.8 a	1.4 b	15.6 bcd	4.58 d-f
BAYLETON 50 WP	.125	55	13.7 ab	21.0 b	1.6 c	14.2 c-f	1.6 b	1.4 b	13.4 b-e	4.73 c-f
FOLICUR 1.2 EC	.125	32	4.9 cd	14.8 b	6.3 b	27.5 bc	4.3 a	2.5 b	17.9 b	4.90 b-e
FOLICUR 1.2 EC	.125	55	17.9 a	20.1 b	2.7 c	2.7 c	0.0 b	0.1 b	4.8 ef	4.32 ef
BAYLETON 50 WP	.125	32								
U FOLICUR 1.2 EC	.125	55	9.6 bc	8.7 b	0.8 c	4.8 ef	0.2 b	0.0 b	4.0 f	4.96 a-e
BAYLETON 50 WP	.125	32								
U TILT 250 EC	.125	55	3.7 cd	8.0 b	1.0 c	8.7 def	0.7 b	0.6 b	6.7 ef	4.92 a-e

1. "U" refers to sequential application.

* Values in the same column which are followed by the same letter are not significantly different at the P=0.005 level (Duncan's Multiple Range Test).

CROP: Winter wheat, cv. Borden

PEST: Powdery mildew, Erysiphe graminis f.sp. tritici; Septoria leaf blotch, Septoria nodorum

TITLE: INFLUENCE OF SEED TREATMENTS ON DISEASE SEVERITY AND YIELD OF WINTER WHEAT, 1987.

MATERIALS: VITAFLO-280 (carbathiin 14.9% + thiram 13.2%); HWG 1608 025FS (ethyltrianol); Baytan (triadimenol 15%)

METHODS: Wheat seed was treated with the test fungicides at rates shown in the table utilizing a Gustafson small batch laboratory seed treater. Planting was on September 7, 1986 in plots 2m x 5m replicated 6 times in a randomized complete block design. The plots received 20 kg N/ha at planting and 3 aliquots of 60 kg N as ammonium nitrate during the growing season. Lodging was controlled by an application of Cerone at Zadoks Growth Stage (ZGS) 39. Winter survival was rated shortly after snow melt as the percentage of each plot surviving. Vigor was rated on a 1-4 scale at ZGS 30 in early spring. Disease ratings were completed on a 1-9 scale at ZGS 45 for powdery mildew and ZGS 72 for Septoria leaf blotch. Yield estimations were based on the harvest at maturity of a 1.25 m strip from the centre of each plot using a Hege 125B plot combine.

NAME AND AGENCY:
JOHNSTON, H.W.
Agriculture Canada, Research Station
Charlottetown, Prince Edward Island
C1A 7M8

RESULTS: See table below.

CONCLUSIONS: The 1987 growing season was characterized as exceptionally dry from late June to early August which resulted in very low disease levels. The disease data collected did not indicate significant differences in mildew or septoria leaf blotch severity as a result of the seed treatments. Baytan and HWG 1608 at the higher application rate improved winter survival slightly. HWG 1608, especially the lower rate, decreased vigor. Seed weights were significantly improved by HWG 1608 at the 0.03 g rate, and Baytan. These same two treatments were the highest yielding treatments but not significantly better than the checks. The low level of naturally occurring diseases resulted in a trial where the diseases of interest were likely to have been sufficiently severe to be yield limiting.

TREATMENT	RATE (g a.i./kg)	WINTER SURVIVAL (%)	VIGOR[1] (1-4)	DISEASE SEVERITY[2] (1-9) MILDEW	DISEASE SEVERITY[2] (1-9) SEPTORIA	1000 KERNEL WEIGHT (g)	YIELD (kg/ha)
Check	-	84	2.8	2.3	2.0	44.4	5583
HWG 1608	0.02	83	2.0	2.0	1.8	44.0	4935
HWG 1608	0.03	93	2.3	2.3	2.5	47.5	6228
VITAFLO-280	0.6	83	3.0	1.7	2.0	45.6	5899
BAYTAN	0.15	93	2.8	1.0	2.3	46.3	5948
	LSD (0.05)	8.9	0.62	NS	NS	1.43	869

[1]Vigor: 1 - poor growth; 4 - good growth.
[2]Disease severity: 1 - healthy; 9 - severe disease.

CROP: Winter wheat, cv. Valor, F29-76, and Borden

PEST: Powdery mildew, Erysiphe graminis f.sp. tritici; Septoria leaf blotch, Septoria nodorum

TITLE: INFLUENCE OF FOLIAR FUNGICIDES ON WINTER WHEAT YIELD, 1987.

MATERIALS: FOLICURE 1.2EC (14.4% ethyltrianol), DITHANE M45 (mancozeb 80% WP), BRAVO (chlorothalonil 50%), CORBEL (fenpropimorph 75%)

METHODS: The three winter wheat cultivars were planted on September 16, 1986 in separate randomized complete block designs. Each treatment was replicated six times on Valor and three times on F29-76 and Borden using 2 x 5m plots. Nitrogen was applied during the summer as ammonium nitrate in three aliquots to a total of 180 kg N/ha. CYCOCEL and CERONE were applied to prevent lodging at Zadoks growth stage (ZGS) 32 and 45, respectively. Foliar fungicides were applied at ZGS 32-35 and again at ZGS 39-45 when a second application was tested. BRAVO was tank-mixed with the second spray when applied with either FOLICURE or CORBEL. All sprays were applied from plot pathways using a tractor sprayer delivering 300 L water at a pressure of 200 kPa. The severity of powdery mildew and septoria leaf blotch was rated on a 1-9 scale at ZGS 70. Yield was estimated by harvesting a 1.25 m strip from the centre of each plot using a Hege 125B plot combine.

NAME AND AGENCY:
JOHNSTON, H.W.
Agriculture Canada, Research Station
Charlottetown, Prince Edward Island
C1A 7M8

RESULTS: See table.

CONCLUSIONS: The summer growing season was very dry and little powdery mildew or septoria leaf blotch developed. None of the foliar fungicides applied resulted in significantly lower disease severity. A significant increase in yield of Valor wheat occurred with two applications of FOLICURE and two of CORBEL, and the double application of FOLICURE plus BRAVO. Although not significant, higher yields also tended to occur with Borden when double applications of fungicides were applied. Foliar diseases were unlikely to have been yield limiting in the trial.

TREATMENT	RATE[1]	YIELD (kg/ha) VALOR	F29-76	BORDEN
Check	-	6049	6776	6094
FOLICURE (1X)[2]	125 g	6147	6648	6455
FOLICURE (2X)	125 g	6795	6705	6699
FOLICURE (2X) + BRAVO (1X)	125 g + 1.8 kg	6944	7291	6986
DITHANE (1X)	1.8 kg	>315	7048	6313
DITHANE (2X)	1.8 kg	6290	7125	6559
BRAVO (1X)	1.8 kg	6273	6957	6511
CORBEL (1X)	750 g	6444	6457	6514
CORBEL (2X)	750 g	6670	6533	6814
CORBEL (2X) + BRAVO (1X)	750 g + 1.8 kg	6346	6418	6317
LSD (0.05)		525	NS	NS

[1]Rate, g or kg a.i./ha.
[2]Number of applications.

CROP: Winter Wheat, cv. Monopol

PEST: Septoria leaf spot, Septoria tritici; Powdery mildew, Erysiphe graminis f. sp. tritici

TITLE: EVALUATION OF FOLIAR FUNGICIDES FOR CONTROL OF DISEASE IN WINTER WHEAT, 1987.

MATERIALS: TILT 250 g ai/L EC (propiconazole), BRAVO 500 g ai/L FW (chlorothalonil), DITHANE M-45 80% WP (mancozeb), EASOUT 70% WP (thiophanate-methyl), CYCOCEL 460 g ai/L EC (chlormequat chloride).

METHODS: The wheat was planted on October 11, 1986 at a seeding rate of 134 kg/ha. Plot size was 6.0 x 15.0 m with 4 replicates per treatment. Fungicide applications were made using an ICM adapted Calsa field sprayer using 8002 tips at 200 kPa to deliver 200 L/ha. Treatments were applied on May 12 (Zadoks G.S. 29-32), June 2 (G.S. 45-50), June 5 (G.S. 50-55) and June 10 (G.S. 55-60). Cycocel 460EC was applied at 0.92 kg ai/ha to the entire trial at G.S. 29-32. Fertility consisted of 68 kg N at G.S. 20-24, 68 kg N at G.S. 30-32 and 34 kg N at G.S. 45-50. Disease ratings consisted of a random sampling of 10 flag leaves per plot. Yield data was based on 18.75 m^2 per plot taken with a Hege small plot combine on July 27.

NAME AND AGENCY:
JOHNS, S.W., and KENNEY, H.L.
Ciba-Geigy Canada Ltd.
1200 Franklin Blvd.
Cambridge, Ontario
N1R 6T5

RESULTS: The results are presented in the table below.

CONCLUSIONS: All treatments provided good control of powdery mildew and Septoria leaf spot under moderate to heavy disease pressure with the exception of two applications of DITHANE M-45. Combination treatments of DITHANE M-45, BRAVO or EASOUT with TILT generally improved disease control. All treatments resulted in a significant increase of 1000 kernel weights. The yield response of Monopol was very good with all treatments resulting in increased yields. The combination treatments of DITHANE M-45, BRAVO or EASOUT in a tank mix with TILT resulted in the highest yields.

TREATMENT	RATE (kg ai/ha)	APPLICATION G.S. Zadoks	% LEAF AREA DISEASED* P. Mildew	Septoria	1000 Kwt (gm)	Std. Yield (t/ha)
Check			7.8 bc**	17.9 b	31.0 b	3.65 d
TILT;TILT	0.125;0.125	29-32;50-55	3.2 ab	9.3 a	34.1 a	4.45 bc
TILT;TILT + DITHANE M-45	0.125;0.125 + 1.5	29-32;50-55	1.3 a	5.2 a	36.3 a	4.70 ab
TILT;TILT + BRAVO	0.125;0.125 + 0.5	29-32;50-55	0.9 a	7.2 a	35.4 a	5.18 a
DITHANE M-45; DITHANE M-45	1.8;1.8	45-50;55-60	10.4 c	19.8 b	34.4 a	3.94 cd
TILT;TILT + EASOUT	0.125;0.125 + 0.7	29-32;50-55	1.0 a	12.9 ab	34.0 a	4.81 ab

* Flag leaf rated June 23 @ G.S. 65-70.
** Values within a column followed by the same letter are not significantly different at the 5% level (DMRT).

CROP: Winter Wheat, cv. Frankenmuth

PEST: Septoria leaf spot, Septoria tritici; Powdery Mildew, Erysiphe graminis f. sp. tritici

TITLE: EVALUATION OF FOLIAR FUNGICIDES FOR CONTROL OF DISEASE IN WINTER WHEAT, 1987.

MATERIALS: TILT 250 g ai/L EC (propiconazole), BRAVO 500 g ai/L FW (chlorothalonil), DITHANE M-45 80% WP (mancozeb), CYCOCEL 460 g ai/L EC (chlormequat chloride).

METHODS: The wheat was planted on October 11, 1986 at a seeding rate of 134 kg/ha. Plot size was 6.0 x 15.0 m with 4 replicates per treatment. Fungicide applications were made using an ICM adapted Calsa field sprayer using 8002 tips at 200 kPa to deliver 200 L/ha. Treatments were applied on May 12 (Zadoks G.S. 29-32), June 2 (G.S. 50-55), and June 10 (G.S. 55-65). Cycocel 460EC was applied at 0.92 kg ai/ha to the entire trial at G.S. 29-32. Fertility consisted of 68 kg N at G.S. 20-24, 68 kg N at G.S. 30-32 and 34 kg N at G.S. 50-55. Disease ratings consisted of a random sampling of 10 penultimate leaves per plot. Yield data was based on 18.75 m^2 per plot taken with a Hege small plot combine on July 22.

NAME AND AGENCY:
JOHNS, S.W., and KENNEY, H.L.
Ciba-Geigy Canada Ltd.
1200 Franklin Blvd.
Cambridge, Ontario
N1R 6T5

RESULTS: The results are presented in the table below.

CONCLUSIONS: Under moderate powdery mildew pressure and high Septoria leaf spot pressure, two applications of TILT significantly reduced the level of foliar disease. Two applications of TILT significantly increased both 1000 kernel weight and yield compared to the check. Combination treatments of DITHANE M-45 or BRAVO with TILT resulted in slightly better disease control compared to TILT alone. However, 1000 kernel weights and yields were not improved. Two applications of DITHANE M-45 did not result in adequate disease control due to high initial disease pressure at first application. Some yield loss was experienced due to lodging.

TREATMENT	RATE (kg ai/ha)	APPLICATION G.S. Zadoks	% LEAF AREA DISEASED* P. Mildew	Septoria	1000 Kwt (gm)	Std. Yield (t/ha)
Check			4.1 b **	20.0 c	31.6 c	5.28 b
TILT;TILT	0.125;0.125	29-32;50-55	0.6 a	6.4 ab	35.3 a	6.24 a
TILT;TILT + DITHANE M-45	0.125;0.125 + 1.5	29-32;50-55	0.6 a	5.6 ab	34.0 ab	6.03 a
TILT;TILT + BRAVO	0.125;0.125 + 0.5	20-32;50-55	0.3 a	4.4 a	32.9 bc	6.03 a
DITHANE M-45; DITHANE M-45	1.8;1.8	50-55;55-65	5.5 b	15.0 bc	32.9 bc	5.87 ab

* Penultimate leaf rated June 19 @ G.S. 65-70

** Values within a column followed by the same letter are not significantly different at the 5% level (DMRT).

CROP: Winter Wheat, cv. Norstar

PEST: Septoria, Septoria spp.
Tan Spot, Pyrenophora trichostoma
Leaf Rust, Puccinia recondita

TITLE: DITHANE M-45, TILT, AND POLYRAM FOR FOLIAR DISEASE CONTROL IN NORSTAR WINTER WHEAT.

NAME AND AGENCY:
STOBBE, E.H., IVERSON, A.T.
Department of Plant Science
University of Manitoba
Winnipeg, Manitoba R3T 2N2

MATERIALS: DITHANE M-45 (mancozeb 80%) WP, TILT (propiconazole 25%) EC, POLYRAM (Metiram 80%) WP.

METHODS: This study was conducted at Portage la Prairie, Manitoba on a Dugas clay loam soil. Norstar winter wheat was seeded directly into barley stubble using zero tillage methods. The seed was treated with Vitavax. A total of 25, 50 and 25 kg/ha of N, P_2O_5, and K, respectively, was applied with the seed. Additional N (116 kg/ha) was broadcast on May 12/1987. Plots, 2m x 7m, were replicated six times in a randomized complete block design. Fungicides were applied using a 4-nozzle, hand held CO_2 sprayer delivering a spray volume of 126 l/ha at 275 kpa. Initial fungicide treatments were applied on June 8 (Zakok's 48-59), and the second application of Dithane M-45 and Polyram were made on June 16. On June 8 the level of the septoria/tan spot was less than 1% on flag and penultimate leaves. On June 16, leaf rust pustuales were not present on the flag leaves, but were present on the penultimate leaves at levels below 1%. Penultimate and flag leaves were sampled on June 25 (Zakok's 72-74), flag leaves on July 2 (Zakok's 83-85), and the percentage of leaf rust and the septoria/tan spot infection was determined. A final leaf rust assessment on the flag leaves was made on July 16 (Zakok's 87-89). In the septoria/tan spot complex, septoria was the primary incitant. The center 6 rows of each plot were harvested on August 5, and grain yield and thousand kernel weights were determined.

RESULTS: Disease levels were low at the time of assessment. Initial lodging of the crop occurred on July 10, and at harvest the crop was completely lodged. Results are summerized in the table below.

CONCLUSIONS: The incidence of the septoria/tan spot complex was too low to assess the effectiveness to the fungicides. Leaf rust appeared to be reduced by all fungicides. Winter wheat treated with Dithane M-45 had the highest 1000 kernel weight.

	Rate (kg/ha)		% Septoria/Tan spot			% Leaf rust			
			Penultimate leaf	Flag leaf		Flag leaf		Grain yield	1000 kwt
Treatment	June 8	June 16	June 25	June 25	July 2	July 2	July 16	(kg/ha)	(g)
Dithane M-45	1.8	1.8	11	0.5	2	Tr	3	4270	33.6 a[1]
Tilt	0.125		12	0.5	1	Tr	7	4430	32.8 ab
Polyram	1.8	1.8	14	0.5	2	Tr	3	4470	32.6 b
Check			14	2.0	3	3	20	4350	32.1 b

[1]Means followed by the same letter do not differ at the 5% level of significance (DMRT).

CROP: Winter Wheat, cv. Norwin

PEST: Septoria, Septoria spp.
Tan Spot, Pyrenophora trichostoma
Leaf Rust, Puccinia recondita

TITLE: DITHANE M-45, TILT, AND POLYRAM FOR FOLIAR DISEASE CONTROL IN NORWIN WINTER WHEAT.

NAME AND AGENCY:
STOBBE, E.H., IVERSON, A.T.
Department of Plant Science
University of Manitoba
Winnipeg, Manitoba R3T 2N2

MATERIALS: DITHANE M-45 (mancozeb 80%) WP, TILT (propiconazole 25%) EC, POLYRAM (metiram 80%) WP.

METHODS: This study was conducted at Portage la Prairie, Manitoba on Dugas clay loam soil. Norwin winter wheat was seeded directly into barley stubble using zero tillage methods. The seed was treated with Vitavax. A total of 25, 50 and 25 kg/ha of N, P_2O_5, and K, respectively, was applied with the seed. Additional N (116 kg/ha) was broadcast on May 12/1987. Plots, 2m x 7m, were replicated six times in a randomized complete block design. Fungicides were applied using a 4-nozzle, hand held CO_2 sprayer delivering a spray volume of 126 l/ha at 275 kpa. Initial fungicide treatments were applied on June 5 (Zakok's 49-50), and the second application of Dithane M-45 and Polyram were made on June 16 (Zakok's 56-67). On June 5 the level of the septoria/tan spot complex was 1% on the flag and 1 to 3% on the penultimate leaves. On June 16, leaf rust pustuales were not present on the flag leaves, but covered 1% of the penultimate leaf area. Penultimate and flag leaves were sampled on June 24 (Zakok's 78-80), flag leaves on July 2 (Zakok's 83-86), and the percentage of leaf rust and the septoria/tan spot infection was determined. In the septoria/tan spot complex, septoria was the primary incitant. The center 6 rows of each plot were harvested on August 5, and grain yield and thousand kernel weights were determined.

RESULTS: Disease levels were low at the time of assessment. Results are summerized in the table below.

CONCLUSIONS: The incidence of the septoria/tan spot complex and leaf rust appeared to be reduced by all fungicide treatments. Yields for all treatments were similar. Winter wheat treated with Tilt appeared to have the highest 1000 kernel weight, although differences were not significant at the 5% level.

	Rate (kg/ha)		% Septoria/Tan spot			% Leaf rust		
			Penultimate leaf	Flag leaf		Flag leaf	Grain yield	1000 kwt
Treatment	June 5	June 16	June 24	June 24	July 2	July 2	(kg/ha)	(g)
Dithane M-45	1.8	1.8	31	2	9	Tr	3840	30.2
Tilt	0.125		22	2	29	Tr	3710	30.8
Polyram	1.8	1.8	38	2	16	Tr	3430	29.5
Check			33	3	64	3	3650	29.2

CROP: Winter Wheat, cv. Norstar

PESTS: Snow Molds (Coprinus psychromorbidus, Myriosclerotinia borealis, Pythium ultimum)

TITLE: EFFECT OF NON-LETHAL INFECTIONS BY SNOW MOLDS OF WINTER WHEAT 1986-1987, Pt. 1

MATERIALS: BAYCOR (bitoxazol) 50 WP, BAYLETON (triadimefon) 50 WP, BAYTAN (triadimenol) 10 DU, BRAVO 500 (chlorothalonil) 25 EC, DEXON (fenaminosulf) 70 WP, GALBEN (benalaxyl) 25 WP, Mercuric chloride ($HgCl_2$) 100 SP, RIZOLEX (tolclofos-methyl) 50 WP, RONILAN (vinclozolin) 50 WP, ROVRAL (iprodione) 50 WP, TERRACHLOR (quintozene) 75 WP.

METHODS: Norstar winter wheat was seeded August 22, 1986, into land that had had winter wheat as a green manure since the previous fall, and been worked up 4 weeks previously and re-worked prior to seeding. Treatments were applied to the 2 centre rows (2 m^2) of 4-row plots with 23 cm spacing. A randomized block design with 6 replicates was used. Sprays were applied November 3 with Green Cross Superspray GX50 hand sprayers in 0.5 L distilled water per plot. Inoculum was natural and therefore uneven but was present in all parts of the plot.

Snow cover was light but continuous, temperatures were seldom very low, and it was overall one of the mildest winters on record.

Head counts were taken in July, 1987, and yields at harvest. Data were subjected to ANOVA.

NAME AND AGENCY:

DAVIDSON, J.G.N.
Agriculture Canada Research Station
BEAVERLODGE, Alberta T0H 0C0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Plant mortality was very low, and there was hardly any visible snow mold at snow melt. Plot differences were much harder to detect visually throughout the season than in previous tests.

Nevertheless, 11 of 19 treatments significantly improved the number of heads, i.e. no. of tillers surviving the winter, and all treatments averaged better than the check.

Yield data were even more striking: 18 of 19 treatments were significantly better than the check. This is the reverse of previous tests (1983 p. 309, 1984 p. 363) in which there were fewer significant treatments for yield than for no. heads.

Several treatments that included a fungicide specific to zoosporic fungi, in this case to P. ultimum, gave more control than either alone, including RONILAN + DEXON, ROVRAL + DEXON, and RIZOLEX + DEXON. The result for BAYCOR + DEXON, which was poorer than BAYCOR alone, is anomalous as compared to previous tests (above, and unpublished).

BAYLETON produced the highest yield, in part because it had the highest yield per head.

Results show that significant loss of tillers and yield occur even when there is little apparent snow mold pressure and in the virtual absence of plant mortality.

TREATMENT	RATE g ai/m^2	HEAD no./plot	YIELD g/plot
BAYTAN + GALBEN	0.24 + 0.2	465 a*	465 ab
BAYLETON	0.56	447 ab	529 a
BAYCOR	0.24	411 abc	453 ab
RONILAN + DEXON	0.5 + 0.86	410 abc	413 bc
ROVRAL + DEXON	4.0 + 0.86	403 abc	431 bc
Mercuric chloride	1.6	399 abc	423 bc
BAYLETON + DEXON	0.56 + 0.86	394 abc	421 bc
TERRACHLOR + DEXON	5.48 + 0.86	394 abc	435 bc
RIZOLEX + DEXON	0.3 + 0.86	393 abc	450 ab
BRAVO 500	3.4	390 abc	404 bc
BRAVO 500 + BAYCOR	3.4 + 0.24	382 abc	389 bc
TERRACHLOR	5.48	367 bcd	386 bc
BAYTAN + DEXON	0.24 + 0.86	364 bcd	416 bc
RONILAN	0.5	363 bcd	385 bc
DEXON	0.86	362 bcd	389 bc
BAYCOR + DEXON	0.24 + 0.86	362 bcd	393 bc
BAYTAN	0.24	356 cd	401 bc
ROVRAL	4.0	353 cd	405 bc
RIZOLEX	0.3	338 cd	348 cd
Check (d.w.)	--	293 d	296 d

* Values in the same column followed by the same letter are not significantly different P = 0.05 (Duncan's Multiple Range Test).

CROP: Winter wheat, cv. Augusta

PEST: Grey snow mold, Typhula ishikariensis, T. incarnata; Pink snow mold, Microdochium nivale.

TITLE: SEED TREATMENT CONTROL OF SNOW MOLD OF WINTER WHEAT 1986

MATERIALS: VITAFLO 280 (carbathiin 149 g/L + thiram 132 g/L), UBI 2051 (carbathiin 167 g/L + thiram 148 g/L), UBI 2383-1 (triadimenol 317 g/L), UBI 2420 (imazalil 20 g/L), UBI 2497 (RH3866 245 g/L), UBI 2393 (carbathiin 220 g/L + thiabendazole 24 g/L), UBI 2394-2 (carbathiin 220 g/L + thiabendazole 24 g/L + imazalil 20 g/L), TF 3656 (triadimenol 75 g/L), TF 3690 (triadimenol 75 g/L + imazalil 25 g/L), TF 3674 (flutriafol 25 g/L), TF 3691 (mancozeb 225 g/L + triadimenol 75 g/L), TF 3694 (mancozeb 225 g/L + imazalil 12.5 g/L), Prochloraz (200 g/L), SN 84364 (flutolanil 50 WP).

METHODS: Wheat seeds were treated with fungicides at rates listed in the table below. Each fungicide was applied in a glass jar which was hand shaken for 15 minutes. Seed treatments were arranged as subplots in a split-plot design with 5 replications. Twenty-five seeds were planted for each treatment in a sandy loam soil near Cambridge, Ontario on 25 September and 09 October 1986. Emergence and plant height were recorded 17 days after planting (GS 12 - Zadoks scale). Subplots were thinned to 10 plants in a 20 cm row 30 days after planting. Main plots (1.2 x 2 m) were treated with grain infested with snow mold pathogens on 27 November 1986. Following 116 days of snow cover, disease was estimated by the Horsfall-Barratt rating system at weekly intervals from 07 April to 26 May 1987. Yield was determined from tillers collected in each subplot on 20 July 1987.

NAME AND AGENCY:
LAWTON, M.B. and BURPEE, L.L.
Department of Environmental Biology, University of Guelph, Guelph, Ontario, N1G 2W1.

RESULTS: Seed treatments UBI 2497, TF 3656, UBI 2383-1 alone and in combination with UBI 2051 or UBI 2420, and both rates of TF 3690, TF 3674 and Prochloraz significantly decreased plant heights at both planting dates. A significant interaction between mainplot (pathogen) and subplot (seed treatments) was observed only in the experiment seeded on 09 October 1986. Simple effects for this experiment are presented in the table below.

CONCLUSIONS: Seed treatments UBI 2497, TF 3656, TF 3690 (0.3 + 0.1 g a.i./kg seed), TF 3674 (0.1) and Prochloraz (0.5) significantly decreased emergence at both planting dates. Seed treatments to wheat planted on 25 September 1986 had no signficant effect on disease intensity or yield with any of snow mold pathogens tested. Seed treatments UBI 2383-1 + UBI 2051, UBI 2383-1 + UBI 2420, TF 3656 and TF 3690 (0.15 + 0.05) significantly decreased the intensity of grey snow mold and increased yield of wheat planted on 09 October 1986. Only seed treatment UBI 2393 or UBI 2394-2 significantly decreased the intensity of pink snow mold and increased yield of wheat planted on 09 October 1986. No seed treatment tested controlled both grey and pink snow mold.

TREATMENT	RATE (g a.i./kg seed)	EMERGENCE (%)[1] 25 Sept.	09 Oct.	T. ishikariensis DI(%)[2]	T. ishikariensis Yield(g)[3]	T. incarnata DI(%)	T. incarnata Yield(g)	M. nivale DI(%)	M. nivale Yield(g)
UNTREATED	--	89c*	86e	100c	2a	72b	16a	100b	1a
VITAFLO 280	0.52	90c	83e	99c	4a	77b	17a	99b	2a
UBI 2051	0.94	91c	86e	100c	2a	72b	15a	100b	0a
UBI 2383-1	0.3	90c	82d	58b	34b	40a	20a	100b	0a
UBI 2420	0.05	90c	85e	100c	1a	74b	21a	100b	0a
UBI 2383-1+UBI 2051	0.3+0.72	90c	82d	59b	24b	31a	26b	100b	0a
UBI 2383-1+UBI 2420	0.3+0.05	94c	83d	55b	26b	37a	27b	92a	10a
UBI 2497	0.3	82a	62b	90c	10a	88b	16a	100b	0a
UBI 2393	0.55+0.06	94c	88e	98c	5a	60b	15a	90a	29b
UBI 2394-2	0.55+0.06+0.05	90c	87e	100c	2a	78b	14a	87a	23b
TF 3656	0.3	86b	80d	31a	30b	26a	32b	100b	0a
TF 3690	0.15+0.05	90c	74c	70b	24b	48a	23b	100b	1a
TF 3690	0.3+0.1	85b	77c	35a	27b	42a	14a	99b	6a
TF 3674	0.05	90c	84e	98c	2a	65b	21a	100b	1a
TF 3674	0.1	86b	80d	98c	2a	61b	18a	100b	1a
TF 3691	0.9+0.3	92c	85e	96c	6a	52b	21a	100b	2a
TF 3694	0.9+0.05	94c	87e	92c	5a	70b	16a	100b	1a
Prochloraz	0.25	88c	82d	100c	1a	67b	18a	100b	0a
Prochloraz	0.5	78a	54a	100c	0a	86b	13a	100b	4a
SN 84364	0.8	91c	86e	99c	6a	68b	15a	99b	4a

1 Mean percent emergence (25 seeds per row) recorded 17 days after planting dates of 25 September and 09 October 1986. Data has been arcsin transformed for analysis.

2 Mean disease intensity recorded 07 April 1987 for wheat planted 09 October 1986. Data has been arcsin transformed for analysis.

3 Mean seed weight in 20 cm row.

* Values in same column which are followed by the same letter are not significantly different at a 0.05 level of probability (Cluster Analysis).

CROP: Winter wheat, cv. Augusta

PEST: Grey snow mold, Typhula ishikariensis, T. incarnata; Pink snow mold, Microdochium nivale.

TITLE: SEED TREATMENT CONTROL OF SNOW MOLD OF WINTER WHEAT 1985

MATERIALS: VITAFLO 280 (carbathiin 149 g/L, thiram 132 g/L), UBI 2383 (triadimenol 317 g/L), UBI 2420 (imazalil 200 g/L), TF 3656 (triadimenol 75 g/L), TF 3690 (triadimenol 75 g/L + imazalil 25 g/L), TF 3674 (flutriafol 25 g/L), Prochloraz (200 g/L), SN 84364 (flutolanil 50 WP).

METHODS: Wheat seeds were treated with fungicides at rates listed in the table below. Each fungicide was applied in a glass jar which was hand shaken for 15 minutes. Seed treatments were arranged as subplots in a split-plot design with 5 replications. Twenty-five seeds were planted for each treatment in a clay loam soil near Elora, Ontario on 18 September and 11 October 1985. Emergence was recorded 16 days after planting (GS 12 - Zadoks scale). Subplots were thinned to 10 plants in a 20 cm row 30 days after planting. Main plots (1 x 2 m) were treated with grain infested with snow mold pathogens on 05 December 1985. Following 114 days of snow cover, disease was estimated by the Horsfall-Barratt rating system at weekly intervals from 03 April to 22 May 1986. Yield was determined from tillers collected in each subplot on 31 July 1986.

NAME AND AGENCY:
LAWTON, M.B.; BURPEE, L.L.; and GOULTY, L.G.
Department of Environmental Biology, University of Guelph, Guelph, Ontario, N1G 2W1.

RESULTS: A significant interaction between mainplot (pathogen) and subplot (seed treatments) was observed only in the experiment seeded on 11 October 1985. Simple effects for this experiment are presented in the table below.

CONCLUSIONS: Seed treatment TF 3656, and both rates of TF 3690, TF 3674 and Prochloraz significantly decreased emergence at both planting dates. Seed treatments to wheat planted on 18 September 1985 had no signficant effect on disease intensity or yield with any of snow mold pathogens tested. Seed treatment TF 3656 or TF 3690 (0.3 + 0.1 g a.i./kg seed) significantly decreased the intensity of grey snow mold and increased yield of wheat planted on 11 October 1985. Pink snow mold was not suppressed by any of the seed treatments tested.

TREATMENT	RATE (g a.i./kg seed)	EMERGENCE (%)[1] 18 Sept.	11 Oct.	T. ishikariensis DI (%)[2]	Yield (g)[3]	T. incarnata DI (%)	Yield (g)	M. nivale DI (%)	Yield (g)
UNTREATED	--	84c*	86d	100b	1a	58b	19a	100	0
VITAFLO 280	0.52	90c	85d	92b	8a	69b	22a	100	0
VITAFLO 280	0.94	87c	85d	97b	3a	49b	33b	100	1
UBI 2383	0.3	82c	84d	98b	2a	52b	24a	100	0
UBI 2420	0.05	85c	84d	100b	3a	48b	23a	100	2
UBI 2383+VITAFLO 280	0.3+0.52	86c	87d	75b	25b	49b	26a	100	3
UBI 2383+UBI 2420	0.3+0.05	80b	81d	72b	19b	44b	28a	98	6
TF 3656	0.3	74b	77c	61a	26b	22a	42b	92	7
TF 3690	0.15+0.05	78b	76c	80b	20b	26a	36b	100	0
TF 3690	0.3+0.1	66a	64b	37a	36b	19a	42b	100	0
TF 3674	0.05	80b	82d	100b	1a	72b	17a	100	2
TF 3674	0.1	59a	72c	87b	12a	60b	25a	100	1
Prochloraz	0.25	74b	67b	84b	12a	52b	28a	100	0
Prochloraz	0.5	59a	46a	95b	8a	56b	21a	99	5
SN 84364	0.8	84c	83d	75b	14a	42b	34a	100	0

1 Mean percent emergence (25 seeds per row) recorded 16 days after planting dates of 18 September and 11 October 1985. Data has been arcsin transformed for analysis.

2 Mean disease intensity recorded 03 April 1986 for wheat planted 11 October 1985. Data has been arcsin transformed for analysis.

3 Mean seed weight in 20 cm row.

* Values in same column which are followed by the same letter are not significantly different at a 0.05 level of probability (Cluster Analysis).

CROP: Winter Wheat, cv. Norstar

PESTS: Snow Molds (Myriosclerotinia borealis Coprinus psychromorbidus, Pythium ultimum)

TITLE: EFFECT OF NON-LETHAL INFECTIONS BY SNOW MOLDS OF WINTER WHEAT 1986-1987, Pt. II

MATERIALS: ARREST (carbathiin + oxycarboxin + thiram) 75 WP, BENLATE (benomyl) 50 WP, DPX-H6573 (unknown) 40 SN, EL-222 (fenarimol) 12.5 EC, Mercuric chloride ($HgCl_2$) 100 SP, MONCUT (flutolanil) 50 WP, RIDOMIL (metalaxyl) 35 SD, TERSAN SP (chloroneb) 65 WP, THIRAM (thiram) 75 WP, UBI-2342 (triflumizole) 30 WP, VITAVAX (carbathiin) 75 WP.

METHODS: Norstar winter wheat was seeded September 23, 1986, into land that had had winter wheat as a green manure since the previous fall, and been worked up 4 weeks previously and re-worked prior to seeding. Treatments were applied to the 2 centre rows (2 m^2) of 4-row plots with 23 cm spacing. A randomized block design with 6 replicates was used. Sprays were applied November 4 with Green Cross Superspray GX50 hand sprayers in 0.5 L distilled water per plot. Inoculum was natural and therefore uneven but was present in all parts of the plot.

Snow cover was light but continuous, temperatures were seldom very low, and it was overall one of the mildest winters on record.

Head counts were taken in July, 1987, and yields at harvest. Data were subjected to ANOVA.

NAME AND AGENCY:

DAVIDSON, J.G.N.
Agriculture Canada Research Station
BEAVERLODGE, Alberta T0H 0C0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Due to the late seeding date the stand was thin, and overall yields were low. Plant mortality was very low, and there was hardly any visible snow mold at snow melt.

Nevertheless, 4 of 19 treatments significantly increased the number of heads, but only 1 of them significantly increased yield. All but 1 treatment averaged more heads and more yield than the check. Six treatments averaged better than mercury.

Although RIDOMIL, which is specific for zoosporic fungi — in this case for P. ultimum, was the poorest treatment when used alone, it was beneficial in combination with several other fungicides, including RIDOMIL + BENLATE + VITAVAX (the best treatment), RIDOMIL + BENLATE, RIDOMIL + MONCUT, and RIDOMIL + UBI-2342.

The best treatment contained fungicides active against all 3 types of snow mold fungi. Comparison with other treatments suggest that BENLATE was the most effective component, indicating that M. borealis was the dominant snow mold, although both C. psychromorbidus and P. ultimum were present and were pathogenic also.

Results also show that significant tiller mortality and loss of yield occur even when there is little apparent snow mold pressure, and in the virtual absence of plant mortality.

TREATMENT	RATE g ai/m^2	HEAD no./plot	YIELD g/plot
RIDOMIL + BENLATE + VITAVAX	0.05 + 1.24 + 1.82	268 a*	187 a
RIDOMIL + BENLATE	0.05 + 1.24	259 a	169 ab
EL-222	0.016	243 a	148 abc
TERSAN SP + BENLATE	3.2 + 1.24	241 a	174 ab
DPX-H 6573	0.56	230 ab	150 abc
ARREST	2.74	230 ab	168 ab
Mercuric chloride	1.6	229 ab	148 abc
RIDOMIL + MONCUT	0.05 + 0.625	229 ab	152 abc
BENLATE	1.24	226 ab	163 abc
RIDOMIL + EL-222	0.05 + 0.016	225 ab	150 abc
RIDOMIL + UBI-2342	0.05 + 0.112	225 ab	140 abc
TERSAN SP	3.2	218 abc	132 abc
THIRAM	3.6	214 abc	163 abc
RIDOMIL + VITAVAX	0.05 + 1.82	208 abc	147 abc
VITAVAX	1.82	206 abc	151 abc
MONCUT	0.625	200 abc	145 abc
RIDOMIL + DPX-H6573	0.05 + 0.56	197 abc	125 abc
UBI-2342	0.112	196 abc	125 abc
Check (d.w.)	--	155 bc	119 bc
RIDOMIL	0.05	146 c	99 c

* Values in the same column followed by the same letter are not significantly different, P = 0.05 (Duncan's Multiple Range Test).

CROP: Winter Wheat, cv. Norstar

PESTS: Coprinus psychromorbidus, Myriosclerotinia borealis, Pythium ultimum

TITLE: EFFECT OF NON-LETHAL INFECTIONS OF SNOWMOLDS ON YIELD OF WINTER WHEAT

MATERIALS: ALIETTE (fosetyl-Al) 80 WP, BAYCOR (biloxazol) 50 WP, BAYLETON (triadimefon) 50 WP, BENLATE (benomyl) 50 WP, BRAVO 500 (chlorothalonil) 25 EC, DEXON (fenaminosulf) 70 WP, DPX-H6573 40SN, EASOUT (thiophanate methyl) 70 WP, GALBEN (benalaxyl) 25 WP, MERCURIC CHLORIDE 100 SP, POTASSIUM CHLORIDE 100 SP, RIDOMIL (metalaxyl) 35SD, ROVRAL (iprodione) 50 WP, SPORTAK (prochloraz) 40 EC, TERRACHLOR (quintozene) 75 WP, TERSAN SP (chloroneb) 65 WP, UBI-2342 30WP, VITAVAX (carbathiin) 75 WP.

METHODS: Norstar winter wheat was seeded in late August into land that had had winter wheat as a green manure, and had been worked up 4 weeks previously, and re-worked prior to seeding. Treatments were applied in a randomized block design. Four-row plots with 23 cm spacing were used, and only the 2 centre rows (2 m^2) were sprayed using Green Cross Superspray GX50 handsprayers. Sprays were applied in late October using 1.0 L distilled water per plot. Head counts were taken in July 1986, and yields at harvest. Inoculum was natural and therefore uneven but present in all parts of the plot.

Snow cover was light but continuous, and the winter was overall of moderate severity despite some very low temperatures and some chinooks.

NAME AND AGENCY:

DAVIDSON, J.G.N.
Agriculture Canada Research Station
BEAVERLODGE, Alberta T0H 0C0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: There was hardly any visible snow mold at snow melt, and mortality was very low. There were fewer M. borealis sclerotia than for the last 10 years. Nearly all plants examined had roots infected with C. psychromorbidus. Beneficial treatment effects were visible from early growth stages onwards as more vigorous growth and more tillers.

The direct effect of snow mold infection was on the number of tillers: when all tillers were killed, the plant died. Head counts showed that 15 of 19 fungicides or fungicide combinations were significantly beneficial. Compensatory filling of heads reduced the number of treatments significantly beneficial to final yield to 8.

The best 4 treatments were experimental combinations that included a component active against Pythium as well as one active against the dominant Coprinus. These combinations were more effective than either component alone, thus indicating that Pythium plays a significant role in tiller mortality of winter wheat.

Mercury ($HgCl_2$) was by no means the best treatment, and chlorine (KCl) was completely ineffective.

The principal result was that snow mold infection can significantly reduce the number of heads and yield even when plant mortality is insignificant.

FUNGICIDE	RATE g ai/m^2	NO. HEADS	YIELD g/m^2
GALBEN + BAYLETON	0.10 + 0.56	482 a*	432 a
DEXON + BAYCOR	0.85 + 0.24	469 a	432 a
DEXON + TERRACHLOR	0.85 + 2.74	444 ab	419 ab
TERSAN SP + BENLATE	3.2 + 0.62	428 ab	411 ab
UBI-2342	0.11	413 ab	401 ab
ROVRAL	4.0	391 abc	394 ab
MERCURIC CHLORIDE	1.6	405 ab	394 ab
BRAVO 500	3.4	407 ab	388 ab
RIDOMIL + BENLATE + VITAVAX	0.05 + 0.62 + 1.82	426 ab	378 abc
TERRACHLOR	5.5	424 ab	368 abc
BAYCOR	0.36	418 ab	365 abc
BENLATE	1.24	344 bcd	360 abc
VITAVAX	1.82	390 abc	360 abc
DPX-H 6573	0.28	355 bc	338 bc
SPORTAK	0.30	319 cd	332 bc
TERSAN SP	3.2	366 bc	320 bc
ALIETTE + ROVRAL	10.0 + 4.0	367 bc	319 bc
Check (d.w.)	--	278 d	295 c
RIDOMIL + EASOUT	0.05 + 0.62	294 cd	290 c
POTASSIUM CHLORIDE	16.8	267 d	280 c

* Numbers followed by the same letter are not significantly different, P = 0.05 (Duncan's Multiple Range Test).

CROP: Winter wheat, cv. Augusta

PEST: Take-all, *Gaeumannomyces graminis* var. *tritici*

TITLE: EFFECTS OF FUNGICIDE SEED TREATMENTS ON GROWTH AND TAKE-ALL OF WINTER WHEAT

MATERIALS: TF-3656 (triadimenol 7.5% liquid), TF-3690 (triadimenol 7.5% liquid plus imazalil 2.5%), TF-3691 (triadimenol 7.5% liquid plus mancozeb 22.5%), UBI-2383 (triadimenol 31.7% flowable), UBI-2420 (imazalil 2.0% flowable), UBI-2051 (VITAFLO 280), TF-3674 (flutriafol 2.5% liquid), SN-84364 50 WP (confidential fungicide), NC-28410 40 EC (confidential fungicide), prochloraz 40 EC.

METHODS: Wheat seeds were treated with the various fungicides at doses indicated in the table. Each fungicide was applied in a 5 L glass jar which was rotated for 20 min. The wheat was sown on 16 September 1985 in 8-row plots (1.6 m X 2.3 m) at the Arkell Research Station. The rows were 17.8 cm apart and the seeding rate was 138 kg/ha. Each treatment was replicated four times in a randomized complete block design. Previous crops in the plot area were mixed barley and oats in 1984 and winter wheat in 1984-85. No inoculum of *G. graminis* var. *tritici* was added to the plots. The lengths of leaf laminae (20 leaves/plot) were measured on 16 October 1985 and 5 May 1986. Fresh weights of leaf laminae were estimated for the spring samples. Take-all was assessed on 3 July 1986 when the wheat was a the soft-dough stage (growth stage 83 on the scale of Zadoks, Chang and Konzak). The disease was assessed by counting tillers with whiteheads and premature leaf and stem senescence characteristic of take-all.

NAME AND AGENCY:
SUTTON, J.C. and TUREK, R.
Department of Environmental Biology, University of Guelph, Guelph, Ontario N1G 2W1

RESULTS: The results are summarized in the table.

CONCLUSIONS: Most of the seed treatments reduced growth of the leaf laminae in the autumn. All products except TF-3691, UBI-2051 and SN-84364 shortened leaf 1, and all treatments except TF-3691, UBI-2051, SN-84364 and prochloraz (low and moderate doses) shortened leaf 2. The lamina length and fresh weight of leaves produced in spring and evaluated on 5 May were not significantly affected by any of the seed treatments. Incidence of whiteheads in July was significantly reduced by all seed treatments. Prochloraz, SN-84364, NC-28410 and triadimenol (TF-3656 and UBI-2383) were highly effective in suppressing take-all. The effectiveness of triadimenol was less when formulated with mancozeb (TF-3691), imazalil (UBI-2383 plus UBI-2420) or VITAFLO 280 (UBI-2051).

Product	Fungicide Dose (g a.i./kg)	Mean length of lamina (mm) on 16 October Leaf 1*	Leaf 2*	Number of whiteheads /m²
Check	-	89 i**	135 e	63.6 a
TF-3656	0.30	71 b-e	110 ab	11.4 ef
TF-3690	0.15 + 0.05	75 c-g	114 bc	14.5 d-f
TF-3690	0.30 + 0.10	68 cd	101 b	11.4 ef
TF-3691	0.30 + 0.90	84 hi	126 c-e	34.3 b
UBI-2383	0.30	79 f-h	117 bc	6.2 f
UBI-2383 + UBI-2420	0.30 + 0.05	75 c-g	114 bc	26.3 b-d
UBI-2383 + UBI-2051	0.30 + 0.58	78 e-h	115 bc	22.7 b-e
UBI-2051	0.58	89 i	134 e	34.8 b
TF-3674	0.10	67 ab	116 bc	29.0 cd
Prochloraz	0.15	81 gh	134 e	17.4 c-f
Prochloraz	0.30	76 d-g	124 c-e	6.0 f
Prochloraz	0.45	72 b-f	117 bc	4.3 f
SN-84364	0.80	84 hi	130 de	8.9 f
NC-28410	0.80	79 e-h	119 b-d	12.7 ef

* Leaves 1 and 2 were the first and second true leaves, respectively.
** Numbers in a column followed by the same letter are not significantly different (P = 0.05) according to Duncan's multiple range test.

CROP: Winter wheat, cv. Augusta

PEST: Take-all, *Gaeumannomyces graminis* var. *tritici*

TITLE: EVALUATION OF FUNGICIDE SEED TREATMENTS FOR SUPPRESSING TAKE-ALL OF WINTER WHEAT

MATERIALS: TF-3656 (triadimenol 7.5% liquid), TF-3738 (triadimenol 7.5% liquid, microencapsulated in polyvinyl acetate), TF-3690 (triadimenol 7.5% liquid plus imazalil 2.5%), UBI-2383 (triadimenol 31.7% flowable), TF-3674 (flutriafol 2.5% liquid), TF-3739 (flutriafol 2.5% liquid microencapsulated in polyvinyl acetate), prochloraz 40 EC, prochloraz 20 SD, UBI-2497 (myclobutanil), and HWG-1608 (ethyltrianol 2.5%).

METHODS: Wheat seeds were treated with the various fungicides at doses indicated in the table. Each fungicide was applied in a glass jar which was rotated for 20 min. The wheat was sown on 9 October 1986 in 6-row plots (1.2 m X 2.0 m) at the Arkell Research Station. The rows were 17.8 cm apart and the seeding rate was 130 kg/ha. Each treatment was replicated four times in a randomized complete block design. To provide inoculum, wheat crowns naturally infested with *G. graminis* var. *tritici* were buried in the plots at a depth of 5-8 cm and a density of 50 crown/m^2 on 14 October 1986. Each crown included 2-3 cm of lower stem. For burying the crowns, holes were made in a regular Pattern between the rows using a thin broom handle. Mixed grain (spring barley and spring oats) had been grown in the plot area in 1984 and the area was fallow in 1985 and 1986. Take-all was assessed on 24 June 1987 when the wheat was at the early dough stage (growth stage 83 on the scale of Zadoks, Chang and Konzak). The disease was assessed by counting tillers with whiteheads and premature leaf and stem senescence characteristic of take-all.

NAME AND AGENCY:
SUTTON, J.C. and TUREK, R.
Department of Environmental Biology, University of Guelph, Guelph, Ontario, N1G 2W1

RESULTS: The results are summarized in the table. Numbers of heads/m^2 in the various plots ranged from 504 to 648 (mean 585).

CONCLUSIONS: Products containing triadimenol (except TF 3690), flutriafol, prochloraz or myclobutanil markedly reduced incidence of severe take-all (whiteheads). The product HWG-1608 did not suppress take-all significantly. Triadimenol in combination with imazalil significantly increased disease incidence. Microencapsulation of triadimenol and flutriafol in polyvinyl acetate did not improve suppression of take-all by the fungicides.

Fungicide		Number of whiteheads/plot
Product	Dose (g a.i./kg seed)	
Check	-	51.8 b*
TF-3656	0.30	0.5 d
TF-3738	0.30	4.5 d
TF-3690	0.30 + 0.10	95.3 a
UBI-2383	0.30	4.5 d
TF-3674	0.10	11.3 d
TF-3739	0.10	12.5 d
prochloraz 40 EC	0.30	9.0 d
prochloraz 20 SD	0.15	6.0 d
prochloraz 20 SD	0.30	12.5 d
UBI-2497	0.30	11.5 d
HWG-1608	0.03	35.3 c

* Duncan's multiple range test, P=0.05

CROP: Winter Wheat, cv. Norwin

PEST: Tan Spot, Pyrenophora trichostoma
Leaf Rust, Puccinia graminis

TITLE: EVALUATION OF TILT AND TILT PLUS MANCOZEB MIXTURES FOR FOLIAR DISEASE CONTROL IN NORWIN WINTER WHEAT.

NAME AND AGENCY:
WARKENTIN, T.D. and WRIGHT, E.B.
ICMS (Integrated Crop Management Services), Inc.
P.O. Box 1351
Portage la Prairie, Manitoba R1N 3N9

MATERIALS: TILT (propiconazole 25%) EC, DITHANE (mancozeb 80%) WP propiconazole + mancozeb (commercial mix) 54.2% WP.

METHODS: Norwin winter wheat was seeded on September 8/86 at a rate of 101 kg/ha at Portage la Prairie, MB. Seed was placed to a depth of 2.5 cm in rows 17 cm apart using a Melroe triple disk drill. Fertilizer was applied with the seed (11-55-0, 112 kg/ha) and topdressed on May 7/87 (34-0-0, 248 kg/ha). Plots were 3x7 m in size and were replicated 4 times in a randomized complete block design. Treatments were applied with a hand-held boom in a volume of 114 l/ha and a pressure of 275 kPa. Treatments 1, 3, and 4 were applied on May 30 when the winter wheat was at Zadok's stage 50; treatment 2 on June 4 at stage 60. Disease assessments were made on June 25 by randomly selecting 10 flag and 10 penultimate (2nd) leaves per plot and visually rating them for percent leaf area covered by tan spot and leaf rust. Assessments were adjusted using the Horsfall-Barratt scale. Yields were determined by harvesting the center 1.14 m of the plots using a Wintersteiger plot combine.

RESULTS: The results are summarized in the table below. One percent of the area of flag and penultimate leaves in the check were covered with leaf rust. For all other treatments only trace amounts were detectable. Drier than normal conditions in April, May, and June prevented disease levels from intensifying.

CONCLUSIONS: Environmental conditions were not conducive to severe disease infestation. All treatments significantly reduced the level of tan spot on the penultimate leaves. Significant differences were not detected for the flag leaf. Applications of TILT at Zadok's stage 50 and 60 were equally effective. The TILT + DITHANE M-45 tank mix, as well as the propiconazole + mancozeb commercial mix, did not differ in effectiveness from each other or from the TILT treatments alone. Treatments did not produce significant increases in yield and thousand kernel weight.

Treatment	Rate (g ai/ha)	Stage Zadok's	% Diseased area tan spot flag	tan spot 2nd	1000 kwt (g)	Yield (kg/ha)
1. TILT	0.125	50	4.3	3.2 b*	37.4	7108
2. TILT	0.125	60	5.0	3.4 b	37.1	7012
3. TILT + DITHANE M-45	0.125 1.5	50	5.0	3.9 b	37.2	7310
4. Propiconazole + Mancozeb	1.63	50	4.0	2.6 b	37.6	7056
5. Check	-	-	7.7	9.6 a	36.7	6919

*Values within a column followed by the same letter are not significantly different at the 5% level (Duncan's Multiple Range Test).

CROP: Winter Wheat, cv. Norstar

PEST: Tan Spot, Pyrenophora trichostoma
Leaf Rust, Puccinia graminis

TITLE: EVALUATION OF BAY-HWG-1608 FOR FOLIAR DISEASE CONTROL IN NORSTAR WINTER WHEAT.

MATERIALS: BAY-HWG-1608 143.8 g ai/l EC, TILT 250 g ai/l (propiconazole).

NAME AND AGENCY:
WARKENTIN, T.D. and WRIGHT, E.B.
ICMS (Integrated Crop Management Services), Inc.
P.O. Box 1351
Portage la Prairie, Manitoba R1N 3N9

METHODS: Norstar winter wheat was seeded on September 8/86 at a rate of 101 kg/ha at Portage la Prairie, MB. Seed was placed to a depth of 2.5 cm in rows 17 cm apart using a Melroe triple disk drill. Fertilizer was applied with the seed (11-55-0, 112 kg/ha) and topdressed on May 7/87 (34-0-0, 248 kg/ha). Plots were 3x7 m in size and were replicated 4 times in a randomized complete block design. Treatments were applied with a hand-held boom in a volume of 114 l/ha and a pressure of 275 kPa on June 4 when the winter wheat was at Zakok's stage 50. Disease assessments were made on June 26 by randomly selecting 10 flag and 10 penultimate (2nd) leaves per plot and visually rating them for percent leaf area covered by tan spot and leaf rust. Assessments were adjusted using the Horsfall-Barratt scale. Yields were determined by harvesting the center 1.14 m of the plots using a Wintersteiger plot combine.

RESULTS: The results are summarized in the table below. As only one percent of the area of flag leaves in the check were covered with leaf rust, and all other treatments had none, the data has not been presented in the table.

CONCLUSIONS: All treatments significantly reduced the level of tan spot on the penultimate leaves. Applications of BAY-HWG-1608 (94.0 g ai/ha) and TILT significantly increased 1000 kwt. Tan spot levels on flag leaves, as well as test weight and grain yield did not differ significantly from the check.

Treatment	Rate (g ai/ha)	% Diseased area tan spot flag	% Diseased area tan spot 2nd	Test weight (kg/hl)	1000 kwt (g)	Yield (kg/ha)
1. BAY-HWG-1608	62.5	4.0	5.0 b*	79.8	37.7 ab	6204
2. BAY-HWG-1608	94.0	3.3	3.8 b	80.4	38.2 a	6507
3. BAY-HWG-1608	125.0	2.3	2.3 b	80.1	37.4 ab	6540
4. BAY-HWG-1608	188.0	3.5	2.8 b	79.5	37.7 ab	6414
5. TILT	125.0	2.0	5.8 b	80.5	38.4 a	6238
6. Check	-	4.5	27.3 a	80.5	36.4 b	6297

*Values within a column followed by the same letter are not significantly different at the 5% level (Duncan's Multiple Range Test).

CROP: Winter Wheat, c.v. Norstar

PEST: *Wheat tan spot, Pyrenophora tritici-repentis*

TITLE: EFFICACY OF FUNGICIDES FOR CONTROL OF TAN SPOT IN WINTER WHEAT.

MATERIALS: RH-3866 24% EC (myclobutanil), RH-7592 60% EC, TILT 25% EC (propiconazole) and DITHANE M-45 80% WP (mancozeb).

METHODS: Norstar winter wheat was seeded near Oak Bluff, Manitoba, September 20, 1986. Each treatment was replicated four times in plots measuring 4 X 5 m. A randomized complete block design was used. Fungicides were applied using a CO_2-powered, hand-held boom 2.5 m in width, with five tee-jet nozzles spaced 50 cm apart at a spray pressure of 350 kPa. Initial treatments were applied at Feekes growth stage 9 (Zadoks 39). Second applications were made at Feekes growth stage 10.1 (Zadoks 50). The first application of fungicides was made on June 4, 1987 (R.H. = 44%, air temperature = 22° C) and the second application of fungicides was made on June 14, 1987 (R.H. = 69%, air temperature = 27° C). Percent leaf area affected by disease was determined at 10, 18 and 30 days after the last application.

NAME AND AGENCY:

WESTWOOD, A.R.
Rohm and Haas Canada Inc.
830 King Edward St., #9
Winnipeg, Manitoba
R3H OP5

RESULTS: Data is summarized in table below. Tan spot infection remained at high levels throughout the test. Wheat was not harvested as extensive winter kill left stand patchy and unevenly distributed within the experimental plot.

CONCLUSIONS: RH-7592 at 0.26 kg/ha in single and double applications provided the best control of tan spot at 30 days after the last application. There was no significant difference in the level of disease control between TILT, DITHANE M-45 and RH-3866 at 30 days after the last application.

Treatment	Growth Stage of Application (ZGS)[1]		Rate (kg ai/ha)	% Infection			
				10 Days Post		18 Days Post	30 Days Post
	39	50		PY TR[2]	PY TR[3]	PY TR[4]	PY TR[4]
1. RH-3866	+	-	0.20	13^{c}[5]	2^{b}	4^{b}	97^{a}
2. RH-3866	+	+	0.20	16^{bc}	2^{b}	2^{b}	82^{a}
3. RH-3866	+	-	0.30	10^{c}	3^{ab}	2^{b}	92^{a}
4. RH-3866	+	+	0.30	19^{bc}	3^{ab}	2^{b}	85^{a}
5. RH-7592	+	-	0.13	11^{c}	2^{b}	1^{b}	85^{a}
6. RH-7592	+	+	0.13	14^{bc}	3^{ab}	3^{b}	86^{a}
7. RH-7592	+	-	0.26	16^{bc}	3^{ab}	2^{b}	71^{b}
8. RH-7592	+	+	0.26	16^{bc}	3^{ab}	2^{b}	75^{b}
9. DITHANE M-45	+	+	1.80	25^{ab}	3^{ab}	2^{b}	97^{a}
10. TILT	+	-	0.12	35^{a}	6^{a}	4^{b}	93^{a}
11. NONE	-	-	-	25^{ab}	6^{a}	12^{a}	98^{a}

1. Zadoks Growth Stage
2. PY TR - Tan spot, *Pyrenophora tritici-repentis* - Flag leaf minus one
3,4. PY TR - Tan spot, *Pyrenophora tritici-repentis* - Flag leaf
5. Values followed by the same letter are not significantly different at the 5% level (DMRT)

Ornamental and Greenhouse Insects

Insectes des plantes ornementales et de serre

Edited by / Révisé par
D. Gillespie

CROP: Annual bluegrass, Creeping bentgrass

PEST: Dollar spot; *Lanzia* spp.
Moellerodiscus spp.

TITLE: EVALUATION OF FUNGICIDES FOR THE CONTROL OF DOLLAR SPOT ON ESTABLISHED TURF, 1987

MATERIALS: PP 523 5FL (50 g/L flowable), C-I-L LAWN FUNGICIDE (300 g/L chlorothalonil), BAYLETON 50WP (50% triadimefon).

METHODS: Plots consisted of 3 x 2 m areas and were replicated 4 times in a randomized complete block design. Treatments were applied on Sept. 9/87 with a hand held pressurized CO_2 sprayer equipped with Tee Jet 8010 nozzles delivering 1000 L/ha spray solution at 170 kPa. Treatments were assessed at weekly intervals by evaluating percent incidence of disease per plot.
Location: Burlington, Ontario

NAME & AGENCY

McLEAR, M.
Chipman, A Business Unit of C-I-L Inc.
400 Jones Road
Stoney Creek, Ontario
L8G 3Z1

RESULTS: The results are summarized in the table below.

CONCLUSIONS: At 1 week after treatment both treatments of PP 523 5FL + C-I-L LAWN FUNGICIDE and C-I-L LAWN FUNGICIDE alone provided superior control of dollar spot compared to BAYLETON 50WP. At 2 weeks after treatment there was no significant difference between the treatments, and all treatments provided acceptable control of dollar spot. None of the treatments was phytotoxic to the turf.

TREATMENT	RATE (kg ai/ha)	% TURF INFECTED WITH DOLLAR SPOT DISEASE[1]					
		1 WAT[4]		2 WAT		3 WAT	
PP 523 5FL	0.050	8.32 ab[2]	(79.4)[3]	0 a	(100)	0 a	(100)
PP 523 5FL	0.075	9.25 ab	(77.1)	0.96 a	(94.2)	0.32 a	(96.4)
PP 523 5FL	0.100	10.70 ab	(73.5)	1.23 a	(92.5)	0.32 a	(96.4)
PP 523 + C-I-L LAWN FUNGICIDE	0.050 + 6.875	6.10 a	(84.9)	0.32 a	(98.1)	0 a	(100)
PP 523 5FL + C-I-L LAWN FUNGICIDE	0.100 + 6.875	5.00 a	(87.6)	0 a	(100)	0 a	(100)
C-I-L LAWN FUNGICIDE	13.750	5.00 a	(87.6)	0 a	(100)	0 a	(100)
BAYLETON 50WP	1.500	14.82 b	(63.3)	1.27 a	(92.3)	0 a	(100)
Untreated check	-	40.37 c		16.48 b		8.77 b	

1. Average percent turf infected with disease per treatment.
2. Treatment means with no letter in common are significantly different at the 5% level (t-test). Data has been arc-sin root transformed for analysis.
3. Percent control relative to the check.
4. WAT = weeks after treatment.

CROP: Annual bluegrass

PEST: Pink snow mold; *Microdochium nivale*

TITLE: EVALUATION OF FUNGICIDES FOR THE CONTROL OF PINK SNOW MOLD, 1986.

MATERIALS: PP 523 5WP (50 g ai/kg), C-I-L LAWN FUNGICIDE (300 g/L chlorothalonil), ARREST 75WP (20% carbathiin, 5% oxycarboxin, 50% thiram).

METHODS: Turf plots consisted of 3 x 2 m areas and were replicated 4 times in a randomized complete block design. Fungicide treatments were applied on Dec. 3, 1986 with a hand-held pressurized CO_2 sprayer equipped with Tee Jet 8010 nozzles delivering 1000 L/ha of spray solution at 170 kPa. Evaluation took place on April 9, 1987 by evaluating percent incidence of disease in each plot.
Location: Owen Sound, Ontario.

NAME & AGENCY:

McLEAR, M.
Chipman, A Business Unit of C-I-L Inc.
400 Jones Road
Stoney Creek, Ontario
L8G 3Z1

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All treatments provided significant control of pink snow mold compared to the check. PP 523 5WP alone at 0.30 kg ai/ha and both treatments of PP 523 5WP + C-I-L LAWN FUNGICIDE provided superior control of pink snow mold compared to ARREST 75WP. No turf phytotoxicity occurred with any of the treatments.

TREATMENT	RATE (kg ai/ha)	% TURF INFECTED WITH PINK SNOW MOLD[1] APRIL 9, 1987	
PP 523 5WP	0.15	0.32 ab[2]	(99.4)[3]
PP 523 5WP	0.20	1.27 ab	(99.7)
PP 523 5WP	0.25	1.13 ab	(98.0)
PP 523 5WP	0.30	0 a	(100)
PP 523 5WP + C-I-L LAWN FUNGICIDE	0.15 + 11.50	0 a	(100)
PP 523 5WP + C-I-L LAWN FUNGICIDE	0.30 + 11.50	0 a	(100)
ARREST 75WP	18.75	2.97 b	(94.7)
Untreated check	-	55.52 c	

1. Average percent turf infected with disease per treatment.
2. Treatment means in the same column followed by the same letter are not significantly different at the 5% level (t-test). Data has been arcsin root transformed for analysis.
3. Percent control relative to the check.

CROP: Annual bluegrass, Creeping bentgrass

PEST: Pink snow mold; Microdochium nivale

TITLE: EVALUATION OF FUNGICIDES FOR THE CONTROL OF PINK SNOW MOLD, 1986

MATERIALS: PP 523 5WP (50 g ai/kg), C-I-L LAWN FUNGICIDE (300 g/L chlorothalonil), ARREST 75WP (20% carbathiin, 5% oxycarboxin, 50% thiram).

METHODS: Turf plots consisted of 3 x 2 m areas and were replicated 4 times in a randomized complete block design. Fungicide treatments were applied on Nov. 25, 1986 with a hand-held pressurized CO_2 sprayer equipped with Tee Jet 8010 nozzles delivering 1000 L/ha of spray solution at 170 kPa. Evaluation took place on March 26, 1987 by evaluating percent incidence of disease in each plot.
Location: Hamilton, Ontario

NAME & AGENCY:

McLEAR, M.
Chipman, A Business Unit of C-I-L Inc.
400 Jones Road
Stoney Creek, Ontario
L8G 3Z1

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All treatments provided significant control of pink snow mold compared to the check. Both treatments of PP 523 5WP + C-I-L LAWN FUNGICIDE and PP 523 5WP alone at 0.25 kg ai/ha provided superior control of pink snow mold compared to PP 523 5WP at 0.15 kg ai/ha and ARREST 75WP. No turf phytotoxicity occurred with any of the treatments.

TREATMENT	RATE (kg ai/ha)	% TURF INFECTED WITH PINK SNOW MOLD[1] MARCH 26, 1987
PP 523 5WP	0.15	9.19 bc[2] (90.1)[3]
PP 523 5WP	0.20	4.38 abc (95.3)
PP 523 5WP	0.25	0.84 a (99.1)
PP 523 5WP	0.30	1.13 ab (98.8)
PP 523 5WP + C-I-L LAWN FUNGICIDE	0.15 + 11.50	0.73 a (99.2)
PP 523 5WP + C-I-L LAWN FUNGICIDE	0.15 + 11.50	0.37 a (99.7)
ARREST 75WP	18.75	10.58 c (88.6)
Untreated check	-	92.70 d

1. Average percent turf infected with disease per treatment.
2. Treatment means in the same column followed by the same letter are not significantly different at the 5% level (t-test). Data has been arcsin root transformed for analysis.
3. Percent control relative to the check.

CROP: Creeping bentgrass cv. Penncross

PEST: Lanzia spp. and Moellerodiscus spp. (=Sclerotinia homeocarpa).

TITLE: CHEMICAL CONTROL OF DOLLAR SPOT ON CREEPING BENTGRASS

MATERIALS: ACR 3675 (Pyrifenox 200 g/l), ANVIL (PP523 5WP), DACONIL 2787 (chlorothalonil 50F), MONCUT (Flutolanil 50WP), NUSTAR (DPX H6573 20DF), ROVRAL (iprodione 50F), ROVRAL GREEN (iprodione 25F).

METHODS: Treatments were applied to a 10-year-old sward of creeping bentgrass. The turfgrass was maintained at a 5 mm cutting height. Cultural practices were similar to those used for maintenance of golf course putting greens in Ontario. The experimental design consisted of a randomized complete block design with four replicates. Twenty-one treatments and an untreated control were included in each block.

NAME AND AGENCY:
BURPEE, L.L. and GOULTY, L.G.
Department of Environmental Biology, University of Guelph, Guelph, Ontario, N1G 2W1.

Each treatment plot measured 1 x 2 m. The turfgrass was inoculated with autoclaved rye grain infested with an isolate of Sclerotinia homeocarpa on 4 July. Fungicides were applied at 7, 14, or 21 d intervals, beginning 7 July, in 7 l of water per 100 m^2 with a wheel-mounted compressed air boom sprayer at 138 kPa. Disease intensity was estimated at 7 d intervals, beginning 14 July, using the Horsfall-Barratt rating scale.

RESULTS: Results are presented in the table below.

CONCLUSIONS: All treatments, except MONCUT applied at 5 and 10 g a.i./100 m^2, provided significant control of dollarspot.

TREATMENT	RATE (g a.i./100 m^2)	APPLICATION INTERVAL (DAYS)	PERCENT DISEASE	DURATION OF CONTROL (DAYS)
DACONIL	24.0	7	0.0*	7
DACONIL	48.0	7	0.0*	7
ROVRAL GREEN	15.0	14	2.3*	7-14
ROVRAL 50WP	15.0	14	2.3*	7-14
NUSTAR	2.0	14	0.0*	14
NUSTAR	4.0	14	0.0*	14
NUSTAR	6.0	14	0.0*	14
MONCUT	5.0	14	54.7	0
MONCUT	10.0	14	56.3	0
MONCUT	15.0	14	35.0*	0
ANVIL	0.5	14	5.9*	7-14
ANVIL	1.0	14	0.6*	7-14
ANVIL	1.5	14	0.0*	14
ANVIL	2.0	14	0.6*	7-14
DACONIL	24.0	14	11.1*	7
DACONIL	48.0	14	2.3*	7-14
ACR 3675	1.0	21	6.4*	14-21
ACR 3675	2.0	21	3.5*	14-21
ACR 3675	4.0	21	1.8*	14-21
ROVRAL GREEN	23.0	21	9.4*	14-21
ROVRAL 50WP	23.0	21	4.7*	14-21
UNTREATED CONTROL	-	-	56.3	0

* significantly different from control at P = 0.05

CROP: Creeping bentgrass cv. Penncross

PEST: Microdochium nivale (=Fusarium nivale)
Typhula ishikariensis

TITLE: CHEMICAL CONTROL OF PINK AND GREY SNOW MOLD ON CREEPING BENTGRASS

NAME AND AGENCY:
BURPEE, L.L. and GOULTY, L.G.
Department of Environmental Biology
University of Guelph
Guelph, Ontario N1G 2W1

MATERIALS: ANVIL (PP523 5WP), BANNER (propiconazole 135 g/l), BAYLETON (triadimefon 50WP), MONCUT (flutolanil 50WP), ROVRAL GREEN (iprodione 25F), SCOTTS LAWN DISEASE PREVENTER (quintozene 17G), UBI 2382 (carbathiin 18 + oxycarboxin 5 + oxadixyl 2WP), XE 779 (diniconazole 25WP).

METHODS: Treatments were applied to a 10 year old sward of creeping bentgrass. Turfgrass cultural treatments were similar to those used for maintenance of golf course putting greens in Ontario. Experimental design consisted of a randomized complete block design with four replications. Each treatment plot measured 1 x 2 m. Wettable powder and flowable formulations were applied in 7 l of water per 100 m^2 with a wheel-mounted compressed air boom sprayer at 138 kPa. A Scotts drop spreader was used to apply SCOTTS LAWN DISEASE PREVENTER. Treatments were applied on 28 November. Turfgrass was inoculated with autoclaved rye grain infested with Microdochium nivale and Typhula ishikariensis on 29 November. Disease intensity was estimated on 30 March. Location: Cambridge, Ontario.

RESULTS: Results are expressed in the table below as percent disease suppression based on mean disease intensities of 77% for pink snow mold and 67% for grey snow mold in untreated control plots.

CONCLUSIONS: All treatments provided significant control of grey snow mold. All treatments, except Bayleton at 15 and 30 g a.i./100 m^2 and MONCUT at 5 and 10 g a.i./100 m^2, provided significant control of pink snow mold. A disease suppression $\geq$ 95% is considered acceptable for fine turf.

Treatment	Rate (g a.i./100 m^2)	Disease Suppression (%) Grey Snow Mold	Pink Snow Mold
BANNER	15	97.3*	87.7*
BANNER	30	99.0*	94.5*
BANNER	60	100.0*	98.8*
BANNER	120	100.0*	100.0*
ANVIL	20	99.0*	95.8*
ANVIL	30	99.0*	95.1*
ROVRAL GREEN	60	97.3*	98.8*
ROVRAL GREEN	120	99.0*	96.3*
XE 779	20	98.0*	87.2*
XE 779	30	100.0*	82.7*
UBI 2382	450+	98.0*	61.8*
SCOTTS LDP	300	99.0*	100.0*
BAYLETON	15	68.2*	30.4
BAYLETON	30	94.2*	34.8
BAYLETON	60	91.5*	61.5*
BAYLETON	120	98.0*	73.6*
MONCUT	5	58.2*	32.9
MONCUT	10	92.3*	39.2
UNTREATED CONTROL	-	0.0	0.0

\+ product/100 m^2
* significantly different from control at P=0.05

CROP: Turf (Bentgrass; Creeping Red Fescue + Kentucky Bluegrass)

PESTS: Snow Molds (Typhula ishikariensis var. canadensis, Myriosclerotinia borealis, Fusarium nivale, Coprinus psychromorbidus, Pythium ultimum)

TITLE: DIFFERENTIAL OR COMBINED CONTROL OF SNOW MOLDS IN SEVERE COMPLEXES ON TURF

MATERIALS: ALIETTE (fosetyl-Al) 80 WP, ARREST (carbathiin + oxycarboxin + thiram) 75 WP, BAYCOR (biloxazol) 50 WP, BENLATE (benomyl) 50 WP, BRAVO 500 (chlorothalonil) 40 EC, DEXON (fenaminosulf) 70 WP, EASOUT (thiophanate methyl) 70 WP, Mercuric chloride ($HgCl_2$) 100 SP, Potassium chloride (KCl) 100 SP, RIDOMIL (metalaxyl) 35 SD, ROVRAL (iprodione) 50 WP, TERRACHLOR (quintozene) 75 WP, TERSAN SP (chloroneb) 65 WP, UBI-2342 (triflumazole) 30 WP, VITAVAX (carbathiin) 75 WP.

METHODS: Treatments were replicated 6 X in a randomized block design on a commercial golf green, and on a domestic lawn, using 1 m^2 plots. Green Cross Superspray GX50 hand sprayers were used to apply those marked (i) on Sept. 19, 1985, and all others on Oct. 21, in 1.0 L distilled water. Near Beaverlodge, Alberta.

Three separate ratings were made on each golf green plot, May 8, 1986, while turf recovery was taking place: (a) patches = sharp-edged patch kills appearing completely dead; (b) diffuse = areas partially to fully dead at the surface, but with recovery starting from deeper tillers, lacking a distinct edge or boundary zone; (c) healthy = area alive and undamaged. For the lawn a combined diseased rating (= a + b) was used because of low disease pressure, May 22. In both, infection was natural but quite uniform.

NAME AND AGENCY:

DAVIDSON, J.G.N.
Agriculture Canada Research Station
BEAVERLODGE, Alberta T0H 0C0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Overall disease development was quite severe. For the third year in a row (see 1984 p. 374, and 1985 p. 386) it was possible to separate and rate the damage into 2 types: patches, caused by T. canadensis and enhanced by C. psychromorbidus; and diffuse, caused by F. nivale and M. borealis, and enhanced some years by P. ultimum. This winter there was little evidence from either direct observation or the data of damage due to F. nivale or P. ultimum.

Patch kills remained the more serious type of damage: mortality was almost total, recovery from deep tillers was slow and incomplete by the end of the season. Thus turf quality was affected all season, and patch remainders formed the nuclei of the next winter's patches.

Although 14 of 19 treatments produced significantly better control of patches, 11 of 19 of diffuse areas, and 9 of 19 for overall health, only the top 2 ($HgCl_2$ and ARREST) produced turf of acceptable quality.

ARREST (i), applied mid-September, had sufficient persistence to last the winter, whereas BENLATE (i) did not, and TERSAN SP (i) was intermediate.

Although damage to the lawn was much lighter due to less snow, more resistant grasses and thicker turf, 11 of 19 treatments gave significant control of the snow molds present. All 11 produced turf of acceptable quality for domestic purposes. The best ones, TERSAN SP (ii) and ROVRAL + ALIETTE were as effective as ARREST (i), $HgCl_2$, and TERRACHLOR.

TREATMENT	RATE	GOLF GREEN						LAWN	
		DISEASED				HEALTHY		DISEASED	
	g ai/m^2	Patches (0-5)		Diffuse (0-5)		(0-10)		(0-5)	
Mercuric chloride	1.6	5.0	a*	5.0	a	10.0	a	1.2	a
ARREST (i)	2.74	4.8	ab	4.2	ab	7.7	b	1.1	a
BAYCOR	0.36	4.1	abc	3.4	bcde	4.3	cd	2.0	bc
VITAVAX	1.82	3.9	bc	3.7	bcd	5.2	c	1.8	abc
BAYCOR + DEXON	0.24 + 0.85	3.8	bc	3.2	cde	3.2	cde	1.8	abc
BRAVO 500	3.4	3.6	c	3.3	bcde	3.7	cde	1.3	ab
TERRACHLOR	5.5	3.5	c	3.7	bcd	3.2	cde	1.2	a
TERRACHLOR + DEXON	2.74 + 0.85	3.3	cd	3.2	cde	3.8	cd	1.3	ab
TERSAN SP (ii)	3.18	2.9	cd	3.5	bcde	3.5	cd	1.0	a
ROVRAL + ALIETTE	4.0 + 10.0	2.7	cd	3.7	bcd	4.0	cd	1.2	a
RIDOMIL + BENLATE + VITAVAX	0.05 + 0.62 + 1.82	2.7	cd	3.7	bcd	3.9	cd	1.5	ab
UBI-2342	0.11	2.7	cd	3.7	bcd	3.5	cd	1.5	ab
ROVRAL	4.0	2.2	d	3.3	bcde	2.0	de	1.6	ab
TERSAN SP + BENLATE	3.18 + 0.62	2.1	d	2.8	de	2.0	de	1.7	abc
POTASSIUM CHLORIDE	16.8	1.6	de	3.2	cde	1.9	de	2.3	c
TERSAN SP (i)	3.18	1.0	e	4.0	bc	2.5	de	1.6	ab
BENLATE (i)	1.24	0.7	e	4.1	bc	1.5	de	2.1	bc
Check (d.w.)	--	0.7	e	2.6	e	0.7	e	2.3	c
EASOUT + RIDOMIL	0.62 + 0.05	0.5	e	3.9	bc	1.7	de	2.3	c
BENLATE (ii)	1.24	0.5	e	3.8	bc	1.2	de	2.4	c

* Values in the same column followed by the same letter are not significantly different, P = 0.05 (Duncan's Multiple Range Test)

CROP: Turf (Bentgrass)

PESTS: Snow Molds (Typhula ishikariensis var. canadensis, Myriosclerotinia borealis, Fusarium nivale, Coprinus psychromorbidus, Pythium ultimum)

TITLE: CONTROL OF A DEVELOPING SNOW MOLD COMPLEX ON A BENTGRASS GREEN

MATERIALS: ARREST (carbathiin + oxycarboxin + thiram) 75 WP, BAYCOR (biloxazol) 50 WP, BAYLETON (triadimefon) 50 WP, BAYTAN (triadimenol) 7.5 L, DEXON (fenaminosulf) 70 WP, DPX-H6573 (unknown) 40 EC, EASOUT (thiophanate methyl) 70 WP, Mercuric chloride ($HgCl_2$) 100 SP, RIZOLEX (tolclofos-methyl) 50 WP, SPORTAK (prochloraz) 40 EC.

METHODS: Treatments were replicated 6 X in a randomized block design on a commercial golf green using 1 m^2 plots. Green Cross Superspray GX50 hand sprayers were used. All treatments were applied 2 X: Sept. 24 and Oct. 21, 1985, near Beaverlodge, Alberta.

Three separate ratings were made of each plot May 8, 1986, while turf recovery was taking place: (a) patches = sharp-edged patch kills appearing completely dead; (b) diffuse = areas partially to fully dead at the surface, but with recovery from deeper tillers, lacking distinct edge or boundary zone; (c) healthy = area alive and undamaged. Infection was natural but uniform. Rating: 0 = dead; 5 or 10 = healthy.

NAME AND AGENCY:

DAVIDSON, J.G.N.
Agriculture Canada Research Station
BEAVERLODGE, Alberta T0H 0C0

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Overall disease development was light to moderate. The green for this test had not been used before for a trial. Snow mold damage was separated and rated into 2 types: patches, caused by T. canadensis and enhanced by C. psychromorbidus; and diffuse areas, caused by F. nivale and M. borealis, enhanced by P. ultimum.

Patch kills remained the more serious because mortality in the surface layer of the turf was total, recovery from deep tillers was slower and was incomplete by the end of the season. Patch remainders formed the nuclei of the next winter's patches.

All treatments were significantly better than the check. However, SPORTAK and $HgCl_2$ did not produce acceptable quality turf. The $HgCl_2$ result is anomalous but is probably due to toxicity caused by the exceptionally high application rate used. SPORTAK was acceptable for diffuse damage but inadequate for patch kills, i.e. against Typhula.

The other fungicides performed as well as ARREST, the positive check, and therefore warrant further testing.

TREATMENT	RATE per application g ai/m^2	RATINGS DISEASED Patches (0-5)	DISEASED Diffuse (0-5)	HEALTHY (0-10)
BAYTAN	0.24	4.7 a*	4.7 a	9.4 a
RIZOLEX + EASOUT	2.0 + 1.24	4.8 a	4.4 a	9.0 ab
BAYLETON	0.56	4.8 a	4.4 a	8.9 ab
BAYCOR	0.24	4.7 a	4.3 a	8.2 ab
DPX-H6573	0.56	4.7 a	4.2 a	8.2 ab
ARREST	2.74	4.7 a	4.1 a	8.5 ab
BAYCOR + DEXON	0.24 + 0.85	4.5 a	4.2 a	8.4 ab
Mercuric chloride	3.2	4.2 a	2.7 b	6.3 c
SPORTAK	0.6	3.3 b	4.2 a	7.8 ab
Check (d.w.)	--	2.5 c	3.0 b	5.2 c

* Values in the same column followed by the same letter are not significantly different, P = 0.05 (Duncan's Multiple Range Test)

CROP: Grape ivy (Cissus rhombifolia) and oak-leaf ivy (Cissus rhombifolia 'Ellen Danica')

PEST: None

TITLE: EVALUATION OF THE PHYTOTOXICITY OF SOIL-APPLIED FUNGICIDES ON CISSUS RHOMBIFOLIA, 1987.

MATERIALS: APRON (metalaxyl 240 g/L EC), TRUBAN (etridiazole 30% WP), LESAN (fenaminosulf 35% WP), ROVRAL (iprodione 50% WP), QUINTOZENE (pentachloronitrobenzene 75% WP), NO-DAMP (oxine benzoate 2.5% SN), VITAVAX-CAPTAN 30W (carbathiin 6% WP + captan 24% WP), Deionized Water.

METHODS: The experiment reported here was conducted in a greenhouse at the ASCHRC, Brooks. Seven fungicides were applied in 100 mL aqueous aliquots, at three different rates each, to the roots of young grape and oak-leaf ivy cuttings growing in 10 cm diameter plastic pots. The growing medium consisted of peat moss, vermiculite, perlite, and loam (14:5:1:7 by volume). Drenches were made at weekly intervals

NAME AND AGENCY:
HOWARD, R.J., MOSKALUK, E.R., and ALLEN, F.T.
Alberta Special Crops and Horticultural Research Center
Brooks, Alberta, T0J 0J0

for a total of three applications. The experiment was designed as a randomized complete block with two replications. Each replication consisted of a single pot containing three cuttings, each ca. 15 cm tall. The rates of application are given in Table 1. Visual estimates of phytotoxicity were made a week after the final drench.

RESULTS: The results are summarized in Table 1. Some of the plants treated with Apron and Truban showed slight signs of chlorosis of the new leaves at the higher application rates. No apparent phytotoxic effects were visible on the plants treated with the remaining chemicals.

CONCLUSIONS: The potential phytotoxicity of the seven products tested was not great enough to preclude their further evaluation as soil drenches for root rot control on C. rhombifolia.

Table 1. Phytotoxicity ratings for seven fungicides applied to the roots of grape and oak-leaf ivy plants.

Treatment	Rate[1] (g a.i./L)	Phytotoxicity ratings[2]	
		Grape ivy	Oak-leaf ivy
APRON 240 g/L EC	0.12	1.0	1.0
	0.36	2.0	1.0
	0.60	2.0	1.0
TRUBAN 30% WP	0.06	1.0	1.0
	0.18	2.0	1.0
	0.30	2.0	2.0
LESAN 35% WP	0.21	1.0	1.0
	0.63	1.0	1.0
	1.05	1.0	1.0
ROVRAL 50% WP	0.20	1.0	1.0
	0.60	1.0	1.0
	1.00	1.0	1.0
QUINTOZENE 75% WP	0.20	1.0	1.0
	0.57	1.0	1.0
	0.95	1.0	1.0
NO-DAMP 2.5% SN	0.25	1.0	1.0
	0.75	1.0	1.0
	1.25	1.0	1.0
VITAVAX-CAPTAN 30% WP	0.08	1.0	1.0
	0.23	1.0	1.0
	0.38	1.0	1.0
Deionized Water	-	1.0	1.0

1 The lowest amount is the recommended label rate for control of root rot on ornamentals.

2 Phytotoxicity ratings: 1.0 = no visible injury, 2.0 = 1-10% leaf tissue damaged, 3.0 = 11-20% leaf tissue damaged, 4.0 = >20% leaf tissue damaged. Ratings are based on visual estimates. Each figure is the mean of two replications.

CROP: Grape ivy (Cissus rhombifolia) and oak-leaf ivy (Cissus rhombifolia 'Ellen Danica')

PEST: None

TITLE: REMOVAL OF VISIBLE FUNGICIDE RESIDUES FROM THE FOLIAGE OF CISSUS RHOMBIFOLIA, 1987.

MATERIALS: BENLATE (benomyl 50% WP), MICROCOP-50 (copper oxychloride 50% WP), OXALIC ACID (reagent grade, 99.9%), VINEGAR (acetic acid 5% SN), SAFER'S INSECTICIDAL SOAP (potassium salts of fatty acids, 50.5% SN), IVORY LIQUID (detergent), LATER'S LEAF SHINE (confidential), Tap Water.

METHOD: The experiment reported here was conducted in a greenhouse at the ASCHRC, Brooks. Two fungicides were applied once, each at four times the label rate recommended for the control of powdery mildew on ornamentals, as foliar sprays to the point of runoff to young grape and oak-leaf ivy plants. Once the fungicide sprays had dried down the leaves were sprayed to runoff with different concentrations of the various residue removal chemicals. The application rates of the fungicides and removal chemicals are given in Table 1. All treatments were replicated three times in a randomized complete block design. Each replication consisted of one 10 cm diameter plastic pot with three cuttings, each ca. 15 cm tall. The removal chemicals were rated for their effectiveness four days after application.

NAME AND AGENCY:
HOWARD, R.J., MOSKALUK, E.R., and ALLEN, F.T.
Alberta Special Crops and Horticultural Research Center
Brooks, Alberta, T0J 0J0

RESULTS: The results are summarized in Table 1.
Benlate Residues - Plants treated with Later's Leaf Shine appeared the best, however, this effect was mostly due to the ability of the product to cover up rather than remove the residues. Ivory Liquid, vinegar and Safer's Soap removed some of the deposits, but usually not any more effectively than tap water. Oxalic acid at all concentrations made the plants look worse than the untreated control.
Microcop-50 Residues - The use of Later's Leaf Shine, vinegar and Safer's Soap all resulted in a significant improvement in plant appearance, but insufficient amounts of residue were removed to make the plants acceptable for retail sale.

CONCLUSIONS: The difficulty of removing residues of fungicides such as Microcop-50 from the leaves of foliage plants may preclude their use in commercial greenhouses and interiorscapes.

Table 1. Efficacy of various chemicals for the removal of visible fungicide residues from the foliage of Cissus rhombifolia.

Residue[1] chemicals	Removal chemicals	Residue removal ratings[2]	
		Grape ivy	Oak-leaf ivy
BENLATE	Oxalic acid 1%	2.7 c	3.0 d
	Oxalic acid 3%	3.7 d	3.0 d
	Oxalic acid 5%	3.7 d	3.0 d
	Ivory Liquid 0.1%	1.7ab	1.7 bc
	Ivory Liquid 0.3%	1.7ab	1.0a
	Ivory Liquid 0.5%	1.0a	1.3ab
	Vinegar	2.0 bc	2.0 c
	Safer's Soap 2.5%	1.3ab	1.3ab
	Later's Leaf Shine	1.0a	1.0a
	Tap water	2.0 bc	2.0 c
	Untreated control	2.0 bc	2.0 c
MICROCOP-50	Oxalic acid 1%	3.7 b	4.0 b
	Oxalic acid 3%	4.0 b	4.0 b
	Oxalic acid 5%	4.0 b	4.0 b
	Ivory Liquid 0.1%	4.0 b	4.0 b
	Ivory Liquid 0.3%	4.0 b	4.0 b
	Ivory Liquid 0.5%	4.0 b	4.0 b
	Vinegar	3.0a	3.0a
	Safer's Soap 2.5%	3.0a	3.0a
	Later's Leaf Shine	3.0a	3.0a
	Tap water	4.0 b	4.0 b
	Untreated control	4.0 b	4.0 b

1 The rates of application were Benlate 1.0 g a.i./L and Microcop-50 8.0 g a.i./L. These amounts are four times the label rate for control of powdery mildew on ornamentals.

2 Residue levels: 1.0 = no visible residues, 2.0 = 1-25% visible residues remaining, 3.0 = 26-50% visible residues remaining, 4.0 = >50% visible residues remaining. Ratings are based on visual estimates. Each figure is the mean of three replications. Numbers followed by the same letter do not differ significantly according to a Duncan's Multiple Range Test ($P<0.05$).

CROP: Grape ivy (Cissus rhombifolia) and oak-leaf ivy (Cissus rhombifolia 'Ellen Danica')

PEST: None

TITLE: EVALUATION OF THE PHYTOTOXICITY AND VISIBLE RESIDUES OF FUNGICIDES APPLIED TO THE FOLIAGE OF CISSUS RHOMBIFOLIA, 1987.

MATERIALS: BENLATE (benomyl 50% WP), KARATHANE WD (dinocap 25% WP), MELTATOX (dodemorph-acetate 400 g/L EC), FUNGINEX (triforine 190 g/L EC), MICROCOP-50 (copper oxychloride 50% WP), MICRO-NIASUL (sulphur 92% WP), Deionized Water.

METHOD: The experiment reported here was conducted in a greenhouse at the ASCHRC, Brooks. Six fungicides were applied as foliar sprays to the point of runoff at three different rates to the leaves of young oak-leaf and grape ivy cuttings, at weekly intervals, for a total of three applications. The treatments were replicated three times in a randomized complete block design. Each replication consisted of one 10 cm diameter plastic pot with three cuttings, each ca. 15 cm tall. The rates of fungicide application are listed in Table 1. Visual estimates of fungicide residues on the foliage were made after each application, and phytotoxicity ratings were done one week after the final application.

NAME AND AGENCY:
HOWARD, R.J., MOSKALUK, E.R. and ALLEN, F.T.
Alberta Special Crops and Horticultural Research Center
Brooks, Alberta, TOJ 0JO

RESULTS: The results are summarized in Table 1.
Phytotoxicity - Only slight phytotoxicity symptoms were visible on the plants. Microcop-50 and Micro-Niasul caused the greatest amount of injury on both species of Cissus.
Visible Residues - Microcop-50 left heavy, undesirable residues on the leaves of both ivies at all application rates. Micro-Niasul and Benlate-treated plants had slight to moderate amounts of residue, while the remaining products left negligible deposits.

CONCLUSIONS: Microcop-50 and Micro-Niasul may not be commercially acceptable for use on grape and oak-leaf ivy because of phytotoxicity and residue problems. The remaining products in this trial warrant further study.

Table 1. Phytotoxicity and leaf residue ratings for six fungicides applied to the foliage of C. rhombifolia.

Treatment	Rate[1] (g a.i./L)	Phytotoxicity[2] ratings (after final application)		Leaf residue[3] ratings (after final application)	
		Oak-leaf ivy	Grape ivy	Oak-leaf ivy	Grape ivy
BENLATE 50% WP	0.25	1.0a	1.0a	2.0 bc	2.7 b
	0.50	1.0a	1.0a	2.7 c	3.0 b
	1.00	1.0a	1.0a	2.7 c	3.0 b
KARATHANE 25% WP	0.09	1.0a	1.0a	1.0a	1.3a
	0.19	1.0a	1.0a	1.0a	1.3a
	0.38	1.3ab	1.0a	1.0a	1.7a
MELTATOX 400 g/L EC	0.40	1.0a	1.0a	1.0a	1.0a
	0.80	1.0a	1.0a	1.0a	1.0a
	1.60	1.0a	1.3ab	1.0a	1.3a
FUNGINEX 190 g/L EC	0.19	1.0a	1.0a	1.3ab	1.0a
	0.38	1.0a	1.0a	1.0a	1.0a
	0.76	1.0a	1.0a	1.0a	1.3a
MICROCOP-50 50% WP	2.00	1.0a	1.0a	4.0 d	4.0 c
	4.00	1.3ab	1.3ab	4.0 d	4.0 c
	8.00	1.7 b	1.7 b	4.0 d	4.0 c
MICRO-NIASUL 92% WP	1.40	1.3ab	1.0a	2.7 c	2.7 b
	2.80	1.0a	1.3ab	2.3 c	3.0 b
	5.50	1.7 b	1.3ab	2.3 c	3.0 b
Deionized Water	-	1.0a	1.0a	1.0a	1.0a

1 Lowest amount is the recommended label rate for control of powdery mildew on ornamentals.

2 Phytotoxicity ratings: 1.0 = no visible injury, 2.0 = 1-10% leaf tissue damaged, 3.0 = 11-20% leaf tissue damaged, 4.0 = >20% leaf tissue damaged. Ratings are based on visual estimates. Each figure is the mean of three replications. Numbers followed by the same letter do not differ significantly according to a Duncan's Multiple Range Test ($P<0.05$).

3 Leaf residue ratings: 1.0 = no visible residues, 2.0 = 1-25% of leaves covered with visible residues, 3.0 = 26-50% leaves covered with visible residues, 4.0 = >50% leaves covered with visible residues. Ratings are based on visual estimates. Each figure is the mean of three replications. Numbers followed by the same letter do not differ significantly according to Duncan's Multiple Range Test ($P<0.05$).

CROP: Oak-leaf ivy (Cissus rhombifolia 'Ellen Danica')

PEST: Powdery mildew (Oidium sp.)

TITLE: EFFICACY OF FUNGICIDES AGAINST POWDERY MILDEW OF CISSUS RHOMBIFOLIA, 1987.

MATERIALS: BENLATE (benomyl 50% WP), KARATHANE WD (dinocap 25% WP), MELTATOX (dodemorph-acetate 400 g/L EC), FUNGINEX (triforine 190 g/L EC), MICROCOP-50 (copper oxychloride 50% WP), MICRO-NIASUL (sulphur 92% WP), Deionized Water.

METHODS: The experiment reported here was conducted in a greenhouse at the ASCHRC, Brooks. Six fungicides were applied once as foliar sprays to the point of runoff, at the recommended label rates for powdery mildew control on ornamentals, to the leaves of young oak-leaf ivy cuttings. After the fungicide sprays had dried down, powdery mildew spores were dusted onto the foliage. The treatments were replicated three times in a randomized complete block design. Each replication consisted of one 10 cm diameter plastic pot with three cuttings, each ca. 15 cm tall. The rates of fungicide application are listed in Table 1. The mildew ratings were done visually four weeks after the spray treatment and spore inoculation procedures.

NAME AND AGENCY:
HOWARD, R.J., MOSKALUK, E.R., and ALLEN, F.T.
Alberta Special Crops and Horticultural Research Center
Brooks, Alberta, T0J 0J0

RESULTS: The results are summarized in Table 1. All products tested, except Microcop-50, provided significant control of mildew relative to the water check. Overall, Karathane and Funginex provided the most effective disease control.

CONCLUSIONS: Further evaluation of the superior products in this trial, under regimes of repeated applications and higher rates, is warranted.

Table 1. Severity of powdery mildew on fungicide-treated oak-leaf ivy plants.

Treatment	Rate (g a.i./L)	Severity[1] of powdery mildew
BENLATE 50% WP	0.25	2.0a
KARATHANE 25% WP	0.09	1.3a
MELTATOX 400 g/L EC	0.40	2.0a
FUNGINEX 190 g/L EC	0.19	1.3a
MICROCOP-50 50% WP	2.00	2.3ab
MICRO-NIASUL 50% WP	1.38	2.0a
Deionized Water	-	3.3 b

[1] Severity: 1.0 = no symptoms, 2.0 = <25% foliage blighted, 3.0 = 26-50% foliage blighted, 4.0 = >50% foliage blighted. These ratings were assigned on the basis of visual estimations.

Each figure is the mean of three replications. Numbers followed by the same letter do not differ significantly according to a Duncan's Multiple Range Test ($P<0.05$).

CROP: Walker poplar, Populus x deltoides 'Walker' Marsh.

PEST: Storage mold, undetermined.

TITLE: PRE-STORAGE FUNGICIDE DIPS TO PREVENT STORAGE MOLD OF POPLAR HARDWOOD CUTTINGS.

MATERIALS: RONILAN 50 WP (vinclozolin), BENLATE 50 WP (benomyl), CAPTAN 50 WP (captan), CYPREX 50 WP (dodine), THIRAM 75 WP (thiram), FERBAM 76 WP (ferbam).

METHODS: The trial was conducted to determine if a pre-storage fungicide dip would prevent mold during refrigerated storage and increase the rooting and proportion of shippable seedlings after planting. Six fungicides were tested along with a water dip check and a non-dipped check. On January 8, 1987, cuttings were treated and placed into storage boxes. Four storage boxes were used for each treatment with several hundred cuttings in each box. The storage boxes were then placed into poly lined bins for overwinter storage at -1°C. On May 8, 1987, the boxes were removed from storage and the cuttings rated for mold using the following scale; 0=no mold, 1-trace of mold on cut ends, 2=mold easily visible on cut ends, 3=small patches of mold on cuttings, 4=large patches of mold on cuttings. A sample of 200 cuttings were removed from each box then field planted in a Randomized Block design of four replications. Each sample of 200 cuttings comprised a plot. On September 23, 1987, the seedlings were harvested, and the percent shippable and undersized rooted cuttings were determined. Plants with a top growth in excess of 30 cm was considered as shippable.

NAME AND AGENCY:
REYNARD, D.A. and NEILL, G.B.
Agriculture Canada
P.F.R.A. Tree Nursery
Indian Head, Saskatchewan SOG 2KO

RESULTS: The results are summarized in the table below.

CONCLUSIONS: The treatments, RONILAN, THIRAM and FERBAM significantly reduced the degree of mold on cuttings during storage. The RONILAN and CAPTAN treatments displayed the most effective rootability and had the highest percent shippable plants. The difference however was not significant. Overall RONILAN was the most effective treatment, however rootability still needs improvement.

Treatment	Rate (kg ai/1000 L)	Mold[1] rating	Percent rooting	Percent shippable
RONILAN 50 WP	1.0	1.00 c	61.3	58.0
BENLATE 50 WP	1.0	2.50 b	35.3	33.9
CAPTAN 50 WP	1.5	2.00 b	50.6	48.6
CYPREX 50 WP	1.5	3.00 a	36.3	33.8
THIRAM 75 WP	9.4	1.00 c	40.4	37.6
FERBAM 76 WP	3.8	1.25 c	42.6	38.6
Water dip check	-	2.00 b	43.7	41.1
Non-dipped check	-	2.25 b	45.2	42.6

[1]Means followed by the same letter are not significantly different at the five percent level according to the Duncan's Multiple Range Test.

CROP: Colorado spruce, Picea pungens Engelm.

PEST: Storage mold, undetermined.

TITLE: FUNGICIDE DIPPING PROCEDURES TESTED FOR CONTROL OF MOLD ON COLORADO SPRUCE SEEDLINGS

MATERIALS: BENLATE 50 WP (benomyl).

METHODS: During the winter of 1985/86, it was noted that 2-3 Colorado spruce seedlings in refrigerated storage were severely infected with mold. The trial tested four dipping procedures at two levels of mold to determine if a treatment would stop the mold from progressing and improve outplanting survival. The four dipping procedures included; seedlings top dipped in BENLATE/cold water, seedlings entirely dipped in BENLATE/cold water, seedlings entirely dipped in BENLATE/warm water, and non-dipped check. The two levels of mold tested in the trial were light and severe. The mold levels were determined by the percentage of mold on each bundle of ten seedlings; light-20 percent or less of the seedlings infected with mold, severe-50 percent or more of the seedlings infected with mold. Each of the eight treatments comprised of two bundles or 20 seedlings and were replicated four times. The trial was conducted on February 3, 1986 at the PFRA Tree Nursery, Indian Head, Saskatchewan. All treatments were placed in sealed polyethylene bags and restored at -3°C until May 16, 1986 when seedlings were visually rated for the progression of mold since treatment. The trial was field planted May 22, in a Randomized Block design with evaluation for survival and needle retention recorded September 10, 1986.

NAME AND AGENCY:
REYNARD, D.A. and NEILL, G.B.
Agriculture Canada
P.F.R.A. Tree Nursery
Indian Head, Saskatchewan SOG 2KO

RESULTS: Results are summarized in table below.

CONCLUSIONS: Mold ratings did not significantly change following dipping treatments. None of the dipping treatments significantly increased survival in comparison to the check at either mold level. The warm BENLATE solution appeared to have a detrimental effect on survival. Based on this trial, none of the treatments could be recommended for control of storage mold on 2-3 Colorado spruce.

Treatments[1]	Pre-treatment mold rating[2] light	severe	mean[3]
	Post-storage mold rating		
Top dipped, BENLATE/cold water	1.0	3.3	2.1 A
Entire dip, BENLATE/cold water	1.5	3.0	2.3 A
Entire dip, BENLATE/warm water	1.3	4.0	2.6 A
Non-dipped check	1.5	3.3	2.4 A
Mean	1.3 a	3.4 b	
	Percent needle retention		
Top dipped, BENLATE/cold water	90.0	20.5	55.3 A
Entire dip, BENLATE/cold water	89.9	42.1	66.0 A
Entire dip, BENLATE/warm water	80.1	14.4	47.2 A
Non-dipped check	94.9	34.6	64.7 A
Mean	88.7 a	27.9 b	
	Percent survival		
Top dipped, BENLATE/cold water	75.1	48.4	61.8 A
Entire dip, BENLATE/cold water	77.3	56.5	66.9 A
Entire dip, BENLATE/warm water	70.5	20.5	45.5 B
Non-dipped check	76.1	60.5	68.3 A
Mean	74.7 a	46.5 b	

[1]BENLATE was used at a rate of 1.0 kg ai/1000 L for all treatments.
[2]Mold rating: 0-no mold to 5-severe mold.
[3]Means followed by the same letter are not significantly different according to SNK test at 0.05 level.

CROP: Colorado spruce, Picea pungens Engelm.

PEST: Storage mold, undetermined.

TITLE: STORAGE TEMPERATURE AND FUNGICIDE DIPPING PROCEDURES TESTED FOR CONTROL OF MOLD ON COLORADO SPRUCE SEEDLINGS.

MATERIALS: BENLATE 50 WP (benomyl).

METHODS: During the winter of 1985/86, it was noted that 2-3 Colorado spruce seedlings in refrigerated storage were severely infected with mold. The trial was set up to determine if certain levels of mold could be controlled using dipping treatments or storage temperatures. In the trial, three dipping procedures at two storage temperatures were tested on three levels of mold for a total of 18 treatments. The three levels of mold tested in the trial were; light, moderate and severe. The mold ratings were determined by the percentage of mold on each bundle of ten seedlings; light-less than 20 percent infected, moderate-between 20 and 50 percent infected, and severe-more than 50 percent infected. The three dipping procedures included; seedlings top dipped in BENLATE solution, seedlings top dipped in water, and non-dipped check. The two storage temperatures tested in the trial were either the normal storage temperature of 0°C or -3°C. Each of the 18 treatments comprised of two bundles or 20 seedlings and were replicated four times. The trial was conducted on February 3, 1986 at the PFRA Tree Nursery, Indian Head, Saskatchewan. All treatments were placed in sealed polyethylene bags and stored at either 0 or -3°C until May 16, 1986 when seedlings were visually rated for the progression of mold since treatment. The trial was field planted May 22, in a Randomized Block design with evaluation for survival and needle retention recorded September 10, 1986.

NAME AND AGENCY:
REYNARD, D.A. and NEILL, G.B.
Agriculture Canada
P.F.R.A. Tree Nursery
Indian Head, Saskatchewan SOG 2KO

RESULTS: The storage temperatures (0°C and -3°C had no significant effect on post-storage mold rating (3.1 vs 2.7), percent needle retention (56.2 vs 57.0) or percent survival (66.8 vs 66.3). Remaining results are summarized in table below.

CONCLUSIONS: The BENLATE dipping treatment significantly reduced the visual rating for mold following storage but did not significantly affect needle retention or survival. Therefore, although the seedlings may have appeared slightly better prior to planting, the fungicide treatment did not result in increased outplanting quality. Seedlings in the severely infected class had a significantly higher post-storage mold rating and significantly lower percent needle retention and survival. In summary, neither lowering storage temperature nor BENLATE dipping treatments were effective in improving seedling quality once mold was detected especially at the severe mold level.

Treatment[1]	Pre-treatment mold rating[2] light	moderate	severe	mean[3]
	Post-storage mold rating			
BENLATE dip	1.4	2.3	3.6	2.4 A
Water-dipped check	2.6	2.8	4.3	3.2 B
Non-dipped check	2.4	2.8	3.9	3.0 B
Mean	2.1 a	2.6 a	3.9 b	
	Percent needle retention			
BENLATE dip	88.1	70.8	22.4	60.5 A
Water dipped check	95.1	61.8	17.3	58.0 A
Non-dipped check	79.1	58.8	15.9	51.3 A
Mean	87.4 a	63.8 b	18.5 c	
	Percent survival			
BENLATE dip	68.8	81.4	57.5	69.2 A
Water dipped check	78.9	74.5	42.4	65.3 A
Non-dipped check	78.6	70.1	46.5	65.1 A
Mean	75.4 a	75.3 a	48.8 b	

[1]BENLATE was used at a rate of 1.0 kg ai/1000 L.
[2]Mold rating: 0-no mold to 5 severe mold.
[3]Means followed by the same letter are not significantly different according to SNK test at 0.05 level.

Nematode Studies

Études sur les nématodes

Edited by / Révisé par
J.W. Potter

CROP: Carrot cv. Imperator

PEST: Northern root-knot nematode, Meloidogyne hapla

TITLE: BAND APPLICATION OF A FUMIGANT FOR ROOT-KNOT NEMATODE CONTROL IN MUCK-GROWN CARROT

MATERIALS: TELONE II-B (1,3-Dichloropropene)

METHODS: The trial was conducted in organic soil in Ste-Clotilde, Quebec. A carrot field with a severe root-knot nematode infestation (100% yield loss the year previous to the trial) was used to evaluate the efficiency of band soil fumigation for root-knot nematode control in carrot production. The fumigant was released from a band fertilizer applicator designed to incorporate the later on a 25 cm width band and a 30 cm depth with a one-wheel rototiller. On June 17, 1987, the following treatments were practiced: 1) fumigant incorporated with rototiller at the 60 l/ha rate; 2) fumigant incorporated with rototiller at the 120 l/ha rate; 3) fumigant injected 20 cm deep with a single shank behind the rototiller at the 60 l/ha rate. The soil surface was immediately sealed off with a trailing roller over the band. Each plot 1.4 m x 10 m was made of 3 carrot rows 45 cm apart. Treatments were replicated 5 times in a complete randomized block design. Five days following fumigation, the carrots were sown over the treated areas without harrowing previously. At maturity (August 31), carrots were harvested on 3 meters of row (3 x 1 m) in each plot to estimate control efficiency.

NAME AND AGENCY:
BELAIR, G.,
FOURNIER, Y.
Research Station, Agriculture Canada
St-Jean-sur-Richelieu, Québec
J3B 6Z8

RESULTS: Results are summarized in the table below. (No phytotoxicity was exhibited from any of soil treatments).

CONCLUSIONS: Broadcast application of soil fumigant in organic soil (TELONE II-B 300 l/ha) are very expensive. From these results band application of TELONE II-B could be an economically interesting alternative for root-knot nematode control in carrot production from the 5-fold reduction in fumigant. Further testings will be needed under different soil and climatic conditions.

Treatment	Rate (l/ha)	Yield (kg/3 m)	Marketable rate (%)	Galling (0-5)
Mixing	60	2.2 b*	70.6 a	1.5 b
Mixing	120	3.2 a	73.1 a	0.5 b
Injection (20 cm deep)	60	4.0 a	90.2 a	0.1 a
Check	--	0.3 c	8.7 b	3.9 c

* Values followed by the same letter are not significantly different at the 5% level by Duncan's multiple range test.

CROP: Raspberry cv. Boyne, cv. Newburg

PEST: Root lesion nematode, Pratylenchus penetrans

TITLE: GRANULAR NEMATICIDE APPLICATIONS IN RASPBERRY PLANTING

MATERIALS: DASANIT 15G (fensulfothion), NEMACUR 15G (fenamiphos), TEMIK 15G (aldicarb)

METHODS: The trial was conducted in 1983, 1984 and 1985 at the Frelighsburg experimental farm (Agriculture Canada) in south-eastern Québec. Plots 1 x 6 m were arranged in a randomized complete design in a raspberry planting severely affected by the root-lesion nematode. Nematicides were applied three times at 5 kg a.i./ha/date on May 19 and May 21, 1983 and September 28, 1984.

NAME AND AGENCY:
BELAIR, G.,
FOURNIER, Y.
Research Station, Agriculture Canada
St-Jean-sur-Richelieu, Québec
J3B 6Z8

The granules were uniformly spread on the soil surface on one side of the plants and incorporated in the top 5 cm with a rototiller. Raspberry plants were harvested 8 times from July 15 to August 12, 1986 for their total yields.

RESULTS: Results are summarized in the table below.

CONCLUSIONS: Although a significant increase in the vigor was recorded in some treatments in both cultivar, this response was not followed with a significant increase in the total yields.

Cv.	Treatment	Rate (kg a.i. /ha)	Weight pruning (kg/6m)	Weight fruit (g/50 fruits)	Yield fruits (kg/6m)	P. penetrans (/100 cc soil)
Boyne	TEMIK	15	3.8 a	112.3 b	7.6 a	174 b
	DASANIT	15	3.5 a	129.2 a	6.9 a	463 a
	NEMACUR	15	2.6 ab	112.1 b	7.7 a	111 b
	Check	0	2.4 b	118.5 ab	7.7 a	322 a
Newburg	TEMIK	15	2.2 a	119.7 a	6.7 a	218 a
	DASANIT	15	2.5 a	122.1 a	7.2 a	549 a
	NEMACUR	15	3.2 b	130.8 b	6.2 a	94 b
	Check	0	2.4 a	119.4 a	6.4 a	246 a

* Values followed by the same letter are not significantly different at the 5% level by Duncan's multiple range test.

CROP: Tomato, cv. Rutgers

PEST: Northern root-knot nematode, Meloidogyne hapla

TITLE: FUMIGATION FOR ROOT-KNOT NEMATODE CONTROL IN ORGANIC SOIL

MATERIALS: TELONE II-B (1,3-Dichloropropene)

METHODS: The trial was conducted under controlled conditions and designed to evaluate the incidence of soil moisture and soil compaction on root-knot nematode control by TELONE II-B. A fibrosol (70% organic content) and two moisture levels were used. The soil was infested with approximately 2,500 nematodes/100 cm^3 (eggs and larvae) prior to moisture adjustment and treatment. Half of the pails (15 cm diam. x 13 cm) filled with 1.5 litre of soil were treated by injecting the fumigant with a syringe. The compound was released 10 cm deep in the centre of the pail at the broadcast rate of 300 l/ha (0.2 ml/pot). After the treatment, the soil surface was 1) hand compacted with a pestle; 2) not compacted. No lid was laid on the pails. Treatments and check was replicated 4 times in a completely randomized design. Pails were maintained at 18 ± 2°C in a well aerated storage room. After 16 days, the soils were turned over and allowed to evaporate for 15 more days. A 1-month old tomato seedling was transplanted in each pail and maintained in the greenhouse at 23 ± 2°C. After a 83 days growth period, the root system of the tomato plants was recovered by washing carefully under running water. The total number of galls per plant was assessed by spreading the roots in a film of water over a light source.

NAME AND AGENCY:
BELAIR, G.,
FOURNIER, Y.
Research Station, Agriculture Canada
St-Jean-sur-Richelieu, Québec
J3B 6Z8

RESULTS: The results are summarized in the table below.

CONCLUSIONS: All soil treatments have significantly reduced the number of infective nematodes, as revealed by the bioassay. When using a wet soil, root-knot nematode control was increased by compacting the soil surface. The level of control was not influenced by compaction under drier soil condition. TELONE II-B gave the best results in the wet (@ 250% moisture) and compacted organic soil.

Soil Type	Moisture (%)	Density (Mg/m^3)	Total number of nodules/plant	
			Untreated	Treated
Dunnigan	150	0.27	5088 a*	433 bc
(70% organic content)	150	0.34	8571 a	427 bc
	250	0.22	7680 a	748 b
	250	0.27	9910 a	299 c

* Values followed by the same letter are not significantly different at the 5% level by Duncan's multiple range test. Data transformed to log (x + 1) prior to analysis.

CROP: Tomato, cv. Rutgers

PEST: Northern root-knot nematode, Meloidogyne hapla

TITLE: FUMIGATION FOR ROOT-KNOT NEMATODE CONTROL IN ORGANIC SOIL

MATERIALS: TELONE II-B (1,3-Dichloropropene)

METHODS: The trial was conducted under controlled conditions and designed to evaluate the incidence of soil moisture and soil organic content on root-knot nematode control by TELONE II-B. Two types of organic soil and three moisture levels were used. Soils were infested with approximately 3,500 nematodes/100 cm^3 (eggs and larval) prior to moisture adjustment and treatment. Half of the pails (15 cm diam. x 13 cm) filled with 1.5 litre of soil were treated by injecting the fumigant with a syringe. The compound was released 10 cm deep in the centre of the pail at the broadcast rate of 300 l/ha (0.2 ml/pot). The soil was slightly compacted on the surface and a air-tight lid was laid on top of each pail. Each treatment was replicated 4 times in a completely randomized design. Pails were maintained at 18 ± 2°C in a well aerated storage room. After 19 days, the lids were removed, the soils were turned over and allowed to evaporate for 15 more days. A 1-month old tomato seedling was then transferred in each pail and maintained in the greenhouse at 23 ± 2°C. After a 69 days growth period, the root system of the tomato plants was recovered by washing carefully under running water. The total number of galls per plant was assessed by spreading the roots in a film of water over a light source.

RESULTS: The results are summarized in the table below.

CONCLUSIONS: The soil treatment provided a 100% control of the root-knot nematode. Because the fumigant was not allowed to escape during treatment period, it is thought that high moisture levels and a high organic content are not major obstacles for good diffusion and mobility of TELONE II-B in these soils.

NAME AND AGENCY:
BELAIR, G.,
FOURNIER, Y.
Research Station, Agriculture Canada
St-Jean-sur-Richelieu, Québec
J3B 6Z8

Soil Type	Moisture (%)	Total number of nodules/plant	
		Untreated	Treated
Dunnigan 70% organic	250	715 d*	0 e
	175	2424 b	0 e
	125	7430 a	0 e
Hemmingford 90% organic	400	822 cd	0 e
	300	1021 d	0 e
	200	10102 a	0 e

* Values followed by the same letter are not significantly different at the 5% level by Duncan's multiple range test. Data transformed to log (x + 1) prior to analysis.

Residue Studies

Études sur les résidus

Edited by / Révisé par
H. Braun; R. Frank

CROP: Asparagus, cv Viking 2V

NAME AND AGENCY:
FRANK, R. and BRAUN, H.E.
Provincial Pesticide Residue Testing Laboratory
University of Guelph
Guelph, Ontario N1G 2W1
RITCEY, G., McIVER, S., AND McEWEN, F.L.
Department of Environmental Biology
University of Guelph
Guelph, Ontario N1G 2W1

TITLE: INSECTICIDE RESIDUE IN ASPARAGUS

MATERIALS: AMBUSH(R) 500 EC (permethrin), CYMBUSH(R) 250 EC (cypermethrin) and DECIS(R) 2.5 EC (deltamethrin).

METHOD: Plots consisted of one row, 17 metres long and replicated four times. The treatments were applied at the rate of 450 litres per hectare with a backpack sprayer. Permethrin, cypermethrin and deltamethrin were applied at the rate of 0.050, 0.035 and 0.010 kg active per hectare, respectively. The crop was sampled at 0, 1 and 2 days after application. Samples were analyzed for residue (method of analyses available on request).

RESULTS: Residue data are presented in Table 1.

CONCLUSIONS: By days 1 and 2, deltamethrin and cypermethrin, respectively, were less than 0.1 mg/kg. Residues of the three pyrethroids declined by 40% each day.

TABLE 1. Residue of permethrin, cypermethrin and deltamethrin in asparagus[1].

Treatments	(kg ai/ha)	Residues in asparagus (mg/kg) Days after application 0	1	2
permethrin	0.050	0.320a[2]	0.175b	0.108c
cypermethrin	0.035	0.238a	0.143b	0.070c
deltamethrin	0.010	0.129a	0.063b	0.029b

1. Treated May 21, 1987.
2. Means followed by the same letter are not significantly different (P=0.05) according to Duncan's Multiple Range Test.

HOST: Beef Cattle

PEST: Horn fly, Haematobia irritans (L.)
Face fly, Musca autumnalis (DeGeer)

NAME AND AGENCY:
SURGEONER, G.A.
FLANNIGAN, G.
Department of Environmental Biology,
University of Guelph,
Guelph, Ontario, N1G 2W1

BRAUN, H.E.
Ontario Provincial Pesticide Laboratory,
University of Guelph,
Guelph, Ontario, N1G 2W1

PURDY, J.
Ciba Geigy Canada Limited,
Agricultural Division,
1200 Franklin Blvd.,
Cambridge, Ontario, N1R 6T5

TITLE: CYPERMETHRIN/DIAZINON RESIDUES IN MEAT ASSOCIATED WITH EAR TAGS

MATERIALS: Ear tags containing 6% cypermethrin and 9.6% diazinon. Ciba Geigy Canada Limited.

METHODS: Three Hereford steers (weighing approximately 450 kg) were treated with two ear tags each (one per ear) and maintained in an indoor/outdoor pen under normal feedlot conditions at the Elora Research Station, University of Guelph. After 14 days, one animal was sacrificed and sampled; two replicate samples of at least 100 g of several tissues were taken (table) prior to carcass washing. The tissue samples were processed within 12 hours without freezing. One set was retained; a second set was sent to the Ontario Pesticide Residue Laboratory for analysis by gas chromatography. Another pair of muscle (tenderloin) samples taken ten days after slaughter were also analyzed to simulate meat that the consumer would buy. After 100 days, the remaining two treated animals were sacrificed and sampled similarly. Also, meat samples were taken from an animal from a herd used in a field efficacy trial (24 weeks after tagging).

RESULTS: The results are summarized in the table.

DISCUSSION: Except for the hair coat, cypermethrin residues were non-detectable. Diazinon was also found on the hair coat, but in other tissues it was detectable only in omental and perirenal fat of the animal sacrificed 14 days after tag attachment. The 14-day period was chosen to determine the highest levels of residue during the entire treatment cycle. The levels were low at 0.032 and 0.035 mg/kg respectively. The limit of detectability for both compounds was 0.01 mg/kg. No detectable residues were found in tissues of animals after 100 days of treatment indicating that there was no accumulation of insecticide over time. The residues of insecticide on the hair of the penned animals is expected to be higher than on field animals due to increased animal interaction because of close confinement, for a given period after tagging. As expected from the results of the penned animals, animal number 5488 (which was on pasture for the summer) had residues on the hair only (table). Therefore there would be no residues in the meat at the normal market time.

Analysis of hair samples showed that the concentrations of the two ingredients were approximately equal on the neck and side at the end of the season, while slightly less diazinon was found on the face.

Analytical[1] results from bovine tissue samples associated with mixed (6% cypermethrin and 9.6% diazinon) ear tags.

	Days After Installation							
	14 Days		100 Days					
	Animal No. 5460		Animal No. 5454		Animal No. 5527		Animal No. 5488[3]	
Tissue Sample	Diaz. (mg/kg)	Cyper. (mg/kg)	Diaz. (mg/kg)	Cyper. (mg/kg)	Diaz. (mg/kg)	Cyper. (mg/kg)	Diaz. (mg/kg)	Cyper. (mg/kg)
Blood	ND[2]	ND	ND	ND	ND	ND	ND	ND
Back Fat (omental)	0.032	ND	ND	ND	ND	ND	ND	ND
Kidney Fat (perirenal)	0.035	ND	ND	ND	ND	ND	ND	ND
Liver	ND	ND	ND	ND	ND	ND	ND	ND
Muscle	ND	ND	ND	ND	ND	ND	ND	ND
Tongue	-	-	ND	ND	ND	ND	ND	ND
Hair								
Face	0.58	4.2	0.29	0.71	0.19	0.36	0.25	0.20
Neck	39	95	0.75	0.54	0.70	0.59	0.31	0.42
Side	3.5	11	0.63	0.51	0.52	0.87	0.22	0.53

[1] Methodology. See Braun, H.E. and J. Stanek. 1982. Application of AOAC multi-residue method to determination of synthetic pyrethroid residues in celery and animal products. J. Assoc. of Analytical Chem. 65: 685-689.

[2] ND = non-detectable $\leq$0.01 mg/kg.

[3] Animal had tags applied early June 1986 and remained on pasture throughout the summer, tags were removed in December at the time of slaughter.

HOST: Charolais Cross-bred Beef Cattle

PEST: Horn fly, Haematobia irritans (L.)
Face fly, Musca autumnalis (DeGeer)

NAME AND AGENCY:
SURGEONER, G.A.
FLANNIGAN, G.
Department of Environmental Biology,
University of Guelph,
Guelph, Ontario, N1G 2W1

BRAUN, H.E.
Ontario Provincial Pesticide Laboratory,
University of Guelph,
Guelph, Ontario, N1G 2W1

TITLE: PERMETHRIN RESIDUES IN MEAT ASSOCIATED WITH ATROBAN(R) DELICE POUR-ON

MATERIALS: Atroban(R) Delice R.T.U. (ready-to-use formulation, 1.0% permethrin).

METHODS: Four Charolais cross-bred steers (weighing approximately 460 kg) were each treated with 150 ml of 1.0% permethrin (15 ml/45 kg of body weight to a maximum of 150 ml) poured along the backs of the cattle from the base of the tail to the top of the head. The cattle were retreated at two-week intervals for a total of five treatments. Cattle were maintained in an indoor/outdoor pen under normal feedlot conditions at the Elora Research Station, University of Guelph. The animals were then slaughtered in groups of two at day 1 and day 7 after the final treatment.

Two replicate samples of at least 250 g of six tissues (table) and two hair samples were taken prior to carcass washing. Tissue samples were refrigerated and extracted for residues within 12 hours of slaughter. The samples were analyzed for residues by the Ontario Pesticide Laboratory using the analytical procedure previously described by Braun and Stanek (1982). In addition, a meat sample was taken from the washed and cleaned carcass of each animal after it had been hung for seven days.

RESULTS: The results are summarized in the table below.

CONCLUSIONS: No detectable residues of permethrin were found in the liver samples in day 1 or day 7 samples. Day 1 blood samples had one sample of 0.014 mg/kg permethrin residue while the other blood samples of day 1 and day 7 had no detectable residue levels. Other tissue samples had low residue levels ranging from 0.006 to 0.084 mg/kg permethrin for both day 1 and day 7 samples. As expected, highest residues were found in fat tissue but all tissue samples provided residues of <.1 mg/kg. Permethrin residues were found on the hair coat. The residues of insecticide on the hair were between 96-750 mg/kg. High residues were found on hair of lower front leg well removed from site of application. Meat hung for seven days had no detectable permethrin residues (ND <0.002 mg/kg).

Reference: Braun, H.E. and J. Stanek. 1982. Application of AOAC multi-residue method to determination of synthetic pyrethroid residues in celery and animal products. J. Assoc. of Analytical Chem. 65: 685-689.

Residues of permethrin in tissue and hair samples of cattle associated with cattle treated five times at two-week intervals at the rate of 15 ml/45 kg, 1.0% permethrin pour-on.

Tissue Sample	Day 1 Permethrin mg/kg		Day 7 Permethrin mg/kg	
	#1	#2	#3	#4
Liver	ND	ND <0.002	ND <0.002	ND <0.002
Kidney	ND	ND	ND	ND
Muscle (Back)	0.014	0.006	0.008	ND
Fat (Back)	0.062	0.058	0.065	0.084
Tongue	0.034	0.029	0.014	0.008
Blood	ND	0.014	ND	ND
Hair (Leg)	300	770	75	22
Hair (Site) of application	350	520	750	96

#1 - 485 kg (at time of slaughter)
#2 - 536 kg
#3 - 486 kg
#4 - 486 kg

One meat sample for each animal slaughtered on day 1 posttreatment and hung for seven days showed no detectable residues.
One meat sample for each animal slaughtered on day 7 posttreatment and hung for seven days showed no detectable residues of permethrin.

HOST: Cattle, Hereford Steers

PEST: Black Flies, Mosquitoes, Tabanids

TITLE: DISTRIBUTION OF PERMETHRIN ON CATTLE AFTER TREATMENT WITH ELECTROSTATIC SPRAYER

MATERIALS: SANBAR® 10E (permethrin, Ciba-Geigy), electrostatic sprayer

METHODS: This field study was located 40 km NE of Athabasca, Alberta in two 15 ha pastures situated less than one kilometer from the Athabasca River. Ten yearling Hereford steers were sprayed in the pasture every 7 days using an electrostatic sprayer at a rate of 0.25 g a.i. per animal (registered rate for whole body spray treatment). Hair samples were collected on one side from three randomly selected steers on June 25 and again on the opposite side on August 27. Samples were taken from three different steers on July 30, 1986. All samples were taken five days after treatment. Hair samples were collected using electric hair clippers from 10 different 160 sq. cm. sampling sites on the body of each animal, namely facial (1), dewlap (2), upper flank (3,4), lower flank (5,6), axilla (7), umbilical (8), inguinal (9), and inside thigh (10). The samples were placed in precleaned glass jars, and returned to the laboratory for determination of permethrin residues. A detection limit of 0.20 ppm was established for this study. Analytical methodology is available upon request.

NAME AND AGENCY:
KUMAR, Y., HUMPHRIES, D., HERBUT, M. J. and PHILIP, H. G.
Alberta Environmental Centre
Bag 4000, Vegreville, Alberta T0B 4L0

RESULTS: Table 1 presents the data on permethrin residues on cattle hair as the average value from three steers sampled on each day. The range of concentration of these three values is given in the parentheses. Residues were generally higher on cattle sampled July 30 than on the cattle sampled June 25 and August 27. Residue levels on cattle sampled June 25 were similar to levels on the same cattle sampled August 27. Residue levels tended to be greater on backs and sides than on the undersides of the animals.

CONCLUSIONS: The electrostatic sprayer is designed to apply the water-based insecticide solution uniformly over the body of an animal. The results of this study reveal that the insecticide solution is indeed applied uniformly and that variation in residue levels among animals is much less than that resulting from self-treatment oilers (Kumar et. al., Pesticide Research Report, 1986, p. 342). There was no apparent build-up of permethrin residues on the hair of cattle treated weekly using the electrostatic sprayer. Animals should not be bunched together when being sprayed to allow the spray solution to reach the undersides of the bodies where many biting flies prefer to feed. Using the formula $A=0.12 \times Wt^{0.6}$ where A= body surface area (m^2) and Wt = body weight (kg) the average total permethrin load on the three animals sampled August 27 was calcualted to be 0.008 g a.i. per animal which is only 3% of the registered dosage (0.25 g a.i. per animal).

Table 2 - Permethrin Residues on Hair from Cattle Exposed to Electrostatic Sprayer

Sample Site	µg Permethrin /g Hair (Range)*		
	June 25, 1986**	July 30, 1986	August 27, 1986
1	0.79 (0.29 - 1.33)	1.00 (0.53 - 1.62)	0.67 (0.44 - 0.86)
2	0.50 (<0.20 - 0.79)	0.55 (0.45 - 0.65)	0.24 (0.21 - 0.27)
3	1.49 (0.98 - 1.78)	3.24 (0.23 - 7.64)	2.37 (0.53 - 4.17)
4	0.90 (0.60 - 1.49)	1.94 (<0.20 - 4.16)	1.53 (1.02 - 1.90)
5	<0.20 (<0.20 - <0.20)	1.17 (0.44 - 1.83)	0.47 (0.27 - 0.77)
6	1.14 (0.83 - 1.41)	2.20 (1.39 - 3.19)	1.06 (0.73 - 1.49)
7	<0.20 (<0.20 - 0.22)	<0.20 (<0.20 - 0.29)	0.24 (<0.20 - 0.36)
8	1.22 (0.65 - 1.68)	0.50 (<0.20 - 1.17)	0.39 (0.27 - 0.62)
9	1.40 (0.67 - 1.81)	<0.20 (<0.20 - 0.24)	0.59 (0.32 - 1.06)
10	0.60 (<0.20 - 1.37)	0.58 (<0.20 - 0.83)	0.69 (0.44 - 1.18)

* Average values from 3 steers sampled.
** Same three steers sampled on August 27, on opposite side.

HOST: Cattle, Hereford Steers

PEST: Black Flies, Mosquitoes, Tabanids

TITLE: PERMETHRIN RESIDUES ON HAIR OF CATTLE EXPOSED TO FORCED-USE PEST DOOM® OILER

MATERIALS: 0.5% SANBAR® (permethrin, Ciba-Geigy) ready-to-use oil solution, Pest Doom® oiler.

METHODS: This field study was located 40 km NE of Athabasca, Alberta in two 15 ha pastures situated less than one kilometer from the Athabasca River. Six yearling Hereford steers were exposed to forced-use Pest Doom® oiler charged with 0.5% ready-to-use permethrin from June 18 to end of August 1986. The Pest Doom® oiler was suspended in the entrance to a corral containing salt blocks and was regularly checked to ensure it was functioning properly. Hair samples were collected from three randomly selected steers on July 24 and again on August 21. Samples were collected using electric hair clippers from 10 different 160 sq. cm. sampling sites on the body of each animal, namely facial (1), dewlap (2), upper flank (3,4), lower flank (5,6), axilla (7), umbilical (8), inguinal (9), and inside thigh (10). The samples were placed in precleaned glass jars, and returned to the laboratory for determination of permethrin residues. A detection limit of 0.20 ppm was established for this study. Analytical methodology is available upon request.

NAME AND AGENCY:
KUMAR, Y., HUMPHRIES, D., HERBUT, M. J. and PHILIP, H. G.
Alberta Environmental Centre
Bag 4000, Vegreville, Alberta T0B 4L0

RESULTS: Table 1 presents the data on permethrin residues on cattle hair as the average value from three steers sampled on each day. The range of concentration of these values is given in the parentheses. On July 24, 1986, most sampling sites had no detectable residues with the exception of upper and lower flank areas and the inguinal area. Residue levels increased at all sampling sites from July 24 to August 21, 1986. Higher residues were detected on the facial and the upper flank areas while lower residues were found on the lower flank, axilla, and umbilical areas. Higher than expected residues were found on the inside of thigh area. This is attributed to cattle behaviour of "bunting" other animals between the hind legs while getting access to water in one trough.

CONCLUSIONS: The higher permethrin residues over the back and flank are consistent with the expected results of using a forced-use backrubber suspended in a corral entrance. The presence of detectable residues on August 21 at all sampling sites indicates that permethrin can spread over the body of an animal by diffusion through sebaceous secretions, by direct animal to animal contact and by self-grooming activity. The results also indicate that residue levels increase over time.

Table 1 - Permethrin Residues on Hair From Cattle Exposed to a Forced-Use Pest Doom® Oiler

Sample Site	µg Permethrin /g Hair (Range)*	
	July 24, 1986	August 21, 1986
1	<0.20 (<0.20 - <0.20)	1.39 (0.73 - 2.74)
2	<0.20 (<0.20 - <0.20)	<0.20 (<0.20 - 0.29)
3	0.47 (<0.20 - 1.20)	2.18 (1.28 - 2.79)
4	<0.20 (<0.20 - <0.20)	3.27 (1.66 - 4.43)
5	<0.20 (<0.20 - <0.20)	0.33 (<0.20 - 0.49)
6	1.06 (<0.20 - 2.99)	0.72 (0.53 - 1.08)
7	<0.20 (<0.20 - <0.20)	0.31 (<0.20 - 0.48)
8	<0.20 (<0.20 - <0.20)	0.35 (<0.20 - 0.86)
9	<0.20 (<0.20 - 0.23)	<0.20 (<0.20 - <0.20)
10	0.20 (<0.20 - 0.40)	0.67 (0.30 - 1.37)

* Average values from 3 steers sampled.

HOST: Holstein Dairy Cattle, Milk

PEST: Horn fly, Haematobia irritans (L.)
Face fly, Musca autumnalis (DeGeer)

NAME AND AGENCY:
SURGEONER, G.A.
FLANNIGAN, G.
Department of Environmental Biology,
University of Guelph
Guelph, Ontario, N1G 2W1

BRAUN, H.E.
Ontario Provincial Pesticide Laboratory,
University of Guelph,
Guelph, Ontario, N1G 2W1

TITLE: PERMETHRIN RESIDUES IN MILK ASSOCIATED WITH ATROBAN(R) DELICE POUR-ON

MATERIALS: Atroban(R) Delice R.T.U. (ready-to-use formulation, 1.0% permethrin). Cooper's Agropharm Inc., Ajax, Ontario.

METHODS: Three Holstein dairy cows (weighing between 600 and 800 kg) were each treated with 150 ml of 1.0% permethrin (15 ml/45 kg of body weight to a maximum of 150 ml) poured along the backs of the cattle from the base of the tail to the top of the head. Two weeks later, the same cattle were retreated. Milk samples were collected from each animal for two weeks after each treatment. Cattle were maintained on a total mixed ration of corn silage, haylage, high moisture corn, soybean meal and mineral supplements. Daily milk production ranged from 15 to 20 kg per animal.

Whole milk samples (100 ml) were analyzed for permethrin residues by the Ontario Provincial Pesticide Laboratory, Guelph, Ontario. The analytical procedure has been described previously by Braun and Stanek (1982).

RESULTS: The results are summarized in the table below. Representative milk samples from treated animals had butterfat levels within the normal range.

CONCLUSIONS: Residues of permethrin in milk of cattle treated with 150 ml of 1.0% permethrin reached a maximum of 24 hours post-treatment with a mean of 6.75 ± 0.21 µg/L. Residues were not detectable (<1 ppb) seven days after treatment. Animals were in good health and no apparent ill effects were observed throughout the trial.

Reference: Braun, H.E. and J. Stanek. 1982. Application of AOAC multi-residue method to determination of synthetic pyrethroid residues in celery and animal products. J. Assoc. of Analytical Chem. 65: 685-689.

Residues of permethrin in whole milk associated the treatment of 1.0% permethrin pour-on, 1987.

Cow #	Sample Time	% Butterfat		Permethrin Residue (µg/kg) Date of Treatment June 29	July 13
1539	-6 hr	4.6		NA[a]	ND
1572	-6 hr	4.6		ND[b]	ND
1576	-6 hr	3.7		ND	ND
1539	6 hr			NA	1.4
1572	6 hr			ND	ND
1576	6 hr			1.5	3.0
			$\bar{x}$	1.5	2.2±1.1
1539	24 hr			9.2	7.2
1572	24 hr			2.6	5.2
1576	24 hr			8.5	7.0
			$\bar{x}$	6.8±3.6	6.5±1.1
1539	3 day			3.6	3.7
1572	3 day			1.9	3.0
1576	3 day			3.7	4.4
			$\bar{x}$	3.1±1.0	3.7±0.7
1539	7 day			ND	ND
1572	7 day			ND	ND
1576	7 day			ND	ND
1539	14 day			ND	ND
1572	14 day			ND	ND
1576	14 day			ND	ND

[a] NA - not available, sample bottle was broken in transit.

[b] ND - not detectable, <1 µg/L.

HOST: Holstein Dairy Cattle, Milk

PEST: Horn fly, Haematobia irritans (L.)
Face fly, Musca autumnalis (DeGeer)

NAME AND AGENCY:
SURGEONER, G.A.
FLANNIGAN, G.
Department of Environmental Biology,
University of Guelph,
Guelph, Ontario, N1G 2W1

BRAUN, H.E.
Ontario Provincial Pesticide Laboratory,
University of Guelph,
Guelph, Ontario, N1G 2W1

TITLE: CYPERMETHRIN AND DIAZINON RESIDUES IN MILK ASSOCIATED WITH COMBINATION INSECTICIDE EAR TAGS

MATERIALS: Ear tags (6% cypermethrin, 11% diazinon), formulation AH 87600, batch numbers 26 B7S02 and 02 C7S01. Ciba Geigy Canada Limited.

METHODS: Two ear tags (one per ear) were attached to each of three Holstein dairy cows on April 30, 1987. Cows were housed with additional animals in a free-stall feedlot and allowed to exercise for approximately one hour per day. Animals were maintained on a total mixed ration of corn silage, haylage, high moisture corn, soybean meal and mineral supplements. Daily production ranged from 12-15 kg/cow. Milk samples were taken five hours pre-application, and five hours, one day, three days, seven days, 14 days, 21 days, and 28 days post-application.

Milk samples were analyzed for butterfat content on day 27 and day 28. All samples were analyzed for cypermethrin and diazinon residues by the Ontario Pesticide Residue Laboratory, Guelph, by a procedure previously described by Braun and Stanek (1982).

RESULTS: The results are summarized in the table below.

CONCLUSIONS: Residues of cypermethrin in milk samples were not detectable (<0.5 ppb) over the entire 28 days of this trial. Residues of diazinon in milk samples were not detectable until three days after tag application. The diazinon residues remained consistently less than 2 µg/kg for the entire residue study. Animals were in good health and no apparent ill effects were observed throughout the trial.

Reference: Braun, H.E. and J. Stanek. 1982. Application of AOAC multi-residue method to determination of synthetic pyrethroid residues in celery and animal products. J. Assoc. of Analytical Chem. 65: 685-689.

Cypermethrin and diazinon residues in whole milk associated with mixed ear tags (6% cypermethrin, 11% diazinon), 1987.

Date	Cow #	Treatment Date	% Butterfat[2]	Residues in Milk[1]	
				Cypermethrin	Diazinon
April 30	1191	-5 hr		ND	ND
(am)	1321	-5 hr		ND	ND
	1525	-5 hr		ND	ND
(pm)	1191	5 hr		ND	ND
	1321	5 hr		ND	ND
	1525	5 hr		ND	ND
May 1	1191	1 day		ND	ND
(am)	1321	1 day		ND	ND
	1525	1 day		ND	ND
May 3	1191	3 days		ND	ND
(am)	1321	3 days		ND	1.4
	1525	3 days		ND	0.52
May 7	1191	7 days		ND	1.4
(am)	1321	7 days		ND	1.2
	1525	7 days		ND	1.7
May 14	1191	14 days		ND	1.1
(am)	1321	14 days		ND	1.4
	1525	14 days		ND	1.7
May 21	1191	21 days		ND	ND
(am)	1321	21 days		ND	1.4
	1525	21 days		ND	1.8
May 28	1191	28 days	3.5	ND	0.73
(am)	1321	28 days	4.0	ND	1.4
	1525	28 days	4.6	ND	1.2

Initial animal weights of Cow # 1191 -590 kg, Cow # 1321 -703 kg and Cow # 1525 -795 kg.
[1] Limit of detectability is 0.5 µ /kg. [2] Based on two samples per animal.

TITLE: RESIDUAL FENVALERATE AND DIOCTYL ADIPATE IN BOVAID EAR TAGS

MATERIALS: Bovaid Eartags (8% fenvalerate)

METHODS: Bovaid eartags (N=16) that had been attached to cattle in mid-June were removed in late April the following year (approximately 45 weeks). Metal studs were removed prior to washing the tags in mild soap and rinsing with distilled water. Each tag was cut up into small pieces and dissolved in tetrahydrofuran. An aliquot of this solution was further purified by precipitating the polyvinyl chloride and centrifuging. The supernatant was analysed by capillary gas chromatography for fenvalerate and dioctyl adipate (DOA), the plasticizer. Ear tags (N=6) that had not been used in the field were analyzed in a similar manner to act as a control group.

NAME AND AGENCY:
WESTCOTT, N.D. and R.A. REICHLE
Research Station, Agriculture Canada
107 Science Crescent
Saskatoon, Saskatchewan
S7N 0X2; and
MCCARTNEY, D.H.
Research Station, Agriculutre Canada
P.O. Box 1240
Melfort, Saskatchewan
S0E 1A0

RESULT: The results are presented in Table 1. Of the 16 tags collected, 3 tags were excluded because of irregularities in weight and shape (N=1) or weight (N=2). The difference in mean weight of tag, fenvalerate and DOA between control and used tags was 1.22, 0.35 and 1.28 g respectively.

CONCLUSION: Approximately 45 weeks after attaching the ear tags, 65% of the insecticide was still present. However, this concentration would not likely have provided horn fly control in the situation as described by Miller et al. (J. Econ. Entomol. 76: 1335-1340, 1983).

Table 1. Weight (grams) of Fenvalerate and Dioctyl Adipate (DOA) in Ear Tags.

Tags	N	Weight (g) of Tag (sd)	Weight (g) of Fenvalerate (sd)	Weight (g) of DOA (sd)
Control	6	10.72 (0.15)	0.99 (0.11)	2.96 (0.11)
Used	13	9.50 (0.19)	0.64 (0.04)	1.68 (0.10)

sd = standard deviation

CROP: Canary grass

TITLE: DIMETHOATE AND OMETHOATE RESIDUES IN CANARY GRASS SEED

MATERIALS: CYGON 480 EC (dimethoate)

METHODS: A field of canary grass was sprayed with Cygon 480 EC on August 1, 1986 at a rate of 210 g a.i./ha. A portion of the field was left unsprayed and served as a control. Samples were taken 20 and 27 days after application. Four samples were taken from the treated portion and 2 samples from the untreated portion. Samples were extracted and analysed for dimethoate and omethoate (method of analysis available on request).

NAME AND AGENCY:
WESTCOTT, N.D. and R.A. REICHLE
Research Station, Agriculture Canada
107 Science Crescent
Saskatoon, Saskatchewan
S7N 0X2

RESULTS: Results are presented in Table 1.

CONCLUSIONS: Residues of 0.02 and 0.04 ppm of dimethoate were detected in all 4 samples of canary grass seed collected 20 days after application of Cygon 480 EC. Residues of 0.02 and 0.05 ppm of dimethoate were detected in 2 samples with no detectable residues of dimethoate in the other 2 samples collected 27 days after application of Cygon 480 EC. Omethoate, a metabolite of dimethoate, was not detectable in any of the samples collected at either sampling date.

Table 1. Residues of dimethoate and omethoate in canary grass seed.

Treatment	Rate g a.i./ha	Days after Application	Dimethoate ppm	Omethoate ppm
Cygon	210	20	0.02	N.D.
Cygon	210	20	0.04	N.D.
Cygon	210	20	0.02	N.D.
Cygon	210	20	0.03	N.D.
Control	---	20	N.D.	N.D.
Control	---	20	N.D.	N.D.
Cygon	210	27	N.D.	N.D.
Cygon	210	27	N.D.	N.D.
Cygon	210	27	0.05	N.D.
Cygon	210	27	0.02	N.D.
Control	---	27	N.D.	N.D.
Control	---	27	N.D.	N.D.

N.D. = not detected (dimethoate < 0.01 ppm, omethoate < 0.06 ppm)

CROP: Canary grass

TITLE: MALATHION RESIDUES IN CANARY GRASS SEED

MATERIALS: MALATHION 500 EC.

METHODS: A field of canary grass was sprayed with malathion 500 EC on August 8, 1986 at a rate of 700 gm a.i./ha. An adjacent field was left unsprayed and served as a control. Samples were taken 20 and 27 days after application. Four samples were taken off the treated field and 2 samples from the untreated field. Samples were extracted and analysed for malathion (method of analysis available on request).

NAME AND AGENCY:
WESTCOTT, N.D. and R.A. REICHLE
Research Station, Agriculture Canada
107 Science Crescent
Saskatoon, Saskatchewan
S7N 0X2

RESULTS: Results are presented in Table 1.

CONCLUSIONS: Residues of malathion (0.02 to 0.03 ppm) were detectable in 3 of 4 samples of canary grass seed collected 20 days after application of malathion. No residues were detected in any of the samples collected 27 days after application.

Table 1. Residues of Malathion in canary grass seed.

Treatment	Rate g a.i./ha	Days after Application	Malathion ppm
Malathion	700	20	N.D.
Malathion	700	20	0.02
Malathion	700	20	0.02
Malathion	700	20	0.03
Control	---	20	N.D.
Control	---	20	N.D.
Malathion	700	27	N.D
Malathion	700	27	N.D.
Malathion	700	27	N.D.
Malathion	700	27	N.D.
Control	---	27	N.D.
Control	---	27	N.D.

N.D. = not detected < 0.01 ppm)

CROP: Carrots, var. Cellobunch

TITLE: RESIDUE IN CARROTS

MATERIALS: Each of the following treatments was applied at two different rates of application, DYFONATE(R) 10 G (fonofos), and THIMET(R) 15 G (phorate).

METHODS: The tests were done at the Holland Marsh on muck soil. The experimental plot was arranged in a randomized complete block design with four replicates. Each replicate was 15 metres long. The granular formulations were applied by using a Stan-Hay precision seeder in a bed of three double rows. Each bed had one rate of application of fonofos, and phorate. The crop was sampled twice, bunching carrots 87 days after planting, and harvest time 127 days after planting. The carrots were topped and the roots analyzed for residue (method of analyses available on request).

NAME AND AGENCY:
RITCEY, G., McIVER, S., and McEWEN, F.L.
Department of Environmental Biology
University of Guelph
Guelph, Ontario N1G 2W1
FRANK, R. and BRAUN, H.E.
Provincial Pesticide Residue Testing Laboratory
University of Guelph
Guelph, Ontario N1G 2W1

RESULTS: Residue data are presented in Table 1.

CONCLUSIONS: Residues of fonofos and phorate at 2.2 kg active per hectare were more than 1.0 mg/kg at bunching time. By harvest date for mature carrots the residues had decreased more than 50%.

These residues were about 10 times higher than those found in a similar test in 1986 (ECPUA Pesticide Research Report, p 336, 1986).

TABLE 1. Residue of insecticides in carrots harvested in August and September after insecticide applications[1].

Treatments	Rate kg ai/ha	Residue in carrots (mg/kg) Days after treatment 87	127
fonofos 10 G	1.1	0.79	0.38
	2.2	1.75	0.77
phorate 15 G	1.1	0.22	0.06
	2.2	1.11	0.23

1. Planted May 11, harvested August 6 and September 14, 1987.

CROP: Carrots var. Cellobunch

NAME AND AGENCY:
RITCEY, G., McIver, S., and McEWEN, F.L.
Department of Environmental Biology
University of Guelph
Guelph, Ontario N1G 2W1
FRANK, R. and BRAUN, H.E.
Provincial Pesticide Residue Testing Laboratory
University of Guelph
Guelph, Ontario N1G 2W1

TITLE: PESTICIDE RESIDUE IN CARROTS AS A RESULT OF FOLIAR TREATMENT

MATERIALS: Cymbush(R) 250 EC (cypermethrin).

METHODS: The tests were done at the Holland Marsh on muck soil. Carrots were planted with a Stan-Hay precision seeder in a bed of three, double rows, 15 metres long. The treatments were applied at a rate of 550 litres per hectare with a tractor-mounted sprayer. Cypermethrin was applied three times at weekly intervals at the rate of 0.07 kg active per hectare. The crop was sampled at various intervals by pulling about 14 carrots, topping and sending the roots for analysis. Samples were analyzed for residue (method of analysis available on request).

RESULTS: Residue data are presented in Table 1.

CONCLUSION: After foliar application of cypermethrin the initial residue was below the detection limit of 0.005 mg/kg.

TABLE 1. Residue of cypermethrin in carrots when the insecticide was applied three times at weekly intervals.[1]

Days after 3rd application	Residue in carrots (mg/kg) cypermethrin
0	ND[2]
1	ND
3	ND
7	ND
10	ND
14	ND

1. Treated August 4, 10 and 17, 1987, at the rate of 0.07 kg active per hectare.
2. ND = not detected; level of detection 0.005 mg/kg.

CROP: Celery (var. Stokes Imp. Utah 52-70)
Lettuce (var. Ithaca)

NAME AND AGENCY:
RITCEY, G., McIVER, and McEWEN, F.L.
Department of Environmental Biology
University of Guelph
Guelph, Ontario N1G 2W1
FRANK, R. AND BRAUN, H.E.
Provincial Pesticide Residue Testing Laboratory
University of Guelph
Guelph, Ontario N1G 2W1

TITLE: MINOR CROPS, INSECTICIDE RESIDUES

MATERIALS: AMBUSH(R) 500 EC (permethrin), CYMBUSH(R) 250 EC (cypermethrin), BELMARK(R) 300 EC (fenvalerate), DECIS(R) 2.5 EC (deltamethrin).

METHODS: The tests were done at the Holland Marsh on muck soil. Eight row plots, 15 metres long were planted with lettuce. Six-row plots, 15 metres long were transplanted with celery. The treatments were applied at a rate of 550 litres per hectare with a tractor-mounted sprayer. Four pyrethroids were combined and applied on celery and lettuce twice at weekly intervals at two rates of application. With all treatments the crops were treated prior to harvest and sampled at various intervals during harvest maturity. Each treatment was replicated four times. Samples were analyzed for residue (methods of analyses available on request).

RESULTS: Data are presented in Tables 1 and 2.

CONCLUSIONS: Initial residues of the four pyrethroids reflected relative rates of application. Residues, as a percentage of plant weight declined at nearly the same rates with all of the insecticides tested with the possible exception of deltamethrin. With this material initial residues were low (reflecting a low rate of application) and these declined to non-detectable levels in about 10 days.

TABLE 1. Residue of pyrethroids in celery when the insecticides were applied twice at weekly intervals prior to harvest[1].

		Residues in celery (mg/kg)					
		Days after 3rd application					
Treatment	Rate (kg ai/ha)	0	2	5	10	15	20
permethrin	0.05	0.059	0.089	0.061	0.025	0.033	0.009
	0.10	0.173	0.132	0.100	0.037	0.091	0.012
cypermethrin	0.035	0.066	0.115	0.066	0.024	0.033	0.007
	0.070	0.211	0.181	0.127	0.022	0.102	0.012
fenvalerate	0.020	0.040	0.072	0.048	0.018	0.029	0.007
	0.040	0.122	0.108	0.084	0.027	0.082	0.010
deltamethrin	0.005	0.014	0.027	0.013	ND[2]	ND	ND
	0.010	0.041	0.038	0.027	ND	0.02	ND

1. Treated Aug. 4 and 11, 1987.
2. ND = not detected; level of detection 0.005 mg/kg.

TABLE 2. Residue of pyrethroids in lettuce when the insecticides were applied twice at weekly intervals prior to harvest[1].

		Residues in lettuce (mg/kg)					
		Days after 3rd application					
Treatment	Rate (kg ai/ha)	0	2	5	10	15	20
permethrin	0.05	0.514	0.328	0.093	0.058	0.018	ND[2]
	0.10	1.115	0.523	0.146	0.088	0.042	ND
cypermethrin	0.035	0.515	0.355	0.104	0.091	0.009	ND
	0.070	1.175	0.528	0.163	0.089	0.024	ND
fenvalerate	0.020	0.270	0.178	0.053	0.027	0.008	ND
	0.040	0.663	0.298	0.095	0.060	0.023	ND
deltamethrin	0.005	0.138	0.079	0.016	ND	ND	ND
	0.010	0.345	0.146	0.035	0.013	ND	ND

1. Treated July 13 and 21, 1987.
2. ND = not detected; level of detection 0.005 mg/kg.

CROP: Cranberry cv. Stevens

PEST: Cranberry girdler, Chrysoteuchia topiaria (Zeller)

TITLE: RESIDUES OF CHLORPYRIFOS AND DIAZINON IN CRANBERRY

NAME AND AGENCY:
SZETO, S. AND S.J. CLEMENTS
Agriculture Canada, Research Station
Vancouver, British Columbia V6T 1X2

MATERIALS: DIAZINON 5G (5% diazinon), DIAZINON 14G (14% diazinon) and LORSBAN 15G (15% chlorpyrifos).

METHODS: LORSBAN 15G, at 1.68 and 3.36 kg ai/ha, was evaluated against cranberry girdler larvae. DIAZINON 5G at 6.72 kg ai/ha and DIAZINON 14G at 3.36 kg ai/ha were also tested. Insecticide granulars were applied as a broadcast treatment with a "shaker jar" except DIAZINON 14G which was applied by helicopter. All treatments were washed in with approximately 12.5 mm of water from the sprinkler system. All experimental plots were 10 m^2 in a randomized complete block design with 4 replicates except the single DIAZINON 14G where the treatment was applied to part of a large cranberry field. Cranberry samples were collected approximately 60 days after the second treatment (see table for dates) for residue analysis.

LOCATION: Pitt Meadows, British Columbia

RESULTS: The results are summarized in the table.

CONCLUSIONS: Residues of chlorpyrifos were detected in samples of cranberry after LORSBAN 15G application. No detectable residues were found in DIAZINON 5G or DIAZINON 14G treated fruit.

Treatment	Formulation	Rate (Kg ai/ha)	Date of Application	Date of Harvest	Residues (ppm, fresh wt.)
1	DIAZINON 5G	6.72	June 23, July 6	Sept 3	N.D.
2	DIAZINON 14G	3.36	June 23, July 6	Sept 3	N.D.
3	DIAZINON 14G	3.36	July 15	Sept 4	N.D.
4	LORSBAN 15G	1.68	June 23, July 6	Sept 3	0.058
5	LORSBAN 15G	3.36	June 23, July 6	Sept 3	0.084

CROP: Eggplant (var. Black Magic)

NAME AND AGENCY:
RITCEY, G., McIVER, S., and McEWEN, F.L.
Department of Environmental Biology
University of Guelph
Guelph, Ontario N1G 2W1
FRANK, R. and BRAUN, H.E.
Provincial Pesticide Residue Testing Laboratory
University of Guelph
Guelph, Ontario N1G 2W1

TITLE: RESIDUE IN EGGPLANT

MATERIALS: AMBUSH(R) 500 EC (permethrin).

METHODS: A four-row plot, 20 metres long was transplanted with eggplant. The treatments were applied at the rate of 800 litres per hectare with a tractor-mounted sprayer. Permethrin was applied three times at weekly intervals at the rate of 0.10 kg active per hectare. The crop was sampled at various intervals after the third application. Samples were analyzed for residue (methods of analyses available on request).

RESULTS: Residue data are presented in Table 1.

CONCLUSIONS: The residue of permethrin was 0.012 mg/kg or less. By day 14, the residue was below the detection level of 0.005 mg/kg.

TABLE 1. Residue of permethrin in eggplant when the insecticide was applied three times at weekly intervals[1].

Days after 3rd application	Residue in eggplant (mg/kg) permethrin
0	0.011
1	0.012
3	0.009
7	0.010
10	0.008
14	ND[2]

1. Treated August 18, 25 and September 1, 1987 at the rate of 0.10 kg active per hectare.
2. ND = not detected; level of detection 0.005 mg/kg.

CROP: Lettuce var. Ithaca

NAME AND AGENCY:
BRAUN, H.E. and FRANK, R.
Provincial Pesticide Residue Testing Laboratory
University of Guelph
Guelph, Ontario N1G 2W1
RITCEY, G., McIVER, S., and McEWEN, F.L.
Department of Environmental Biology
University of Guelph
Guelph, Ontario N1G 2W1

TITLE: INSECTICIDE RESIDUE IN LETTUCE

MATERIALS: Cymbush(R) 250 EC (cypermethrin).

METHODS: The tests were done at the Holland Marsh on muck soil. Eight-row plots, 15 metres long were planted with lettuce. The treatment was applied at a rate of 550 litres per hectare with a tractor-mounted sprayer. Cypermethrin was applied three times at weekly intervals at the rate of 0.07 kg active per hectare. The crop was treated prior to harvest and sampled at various intervals during harvest maturity. Treatment was replicated four times. Samples were analyzed for residue (methods of analyses available on request).

RESULTS: Residue data are presented in Table 1.

CONCLUSIONS: The residue of cypermethrin declined with increased time after treatment. By day 10 the residue of cypermethrin was less than 0.1 mg/kg.

TABLE 1. Residue of cypermethrin in lettuce when the insecticide was applied at weekly intervals prior to harvest[1].

Days after application	Residue in lettuce (mg/kg) cypermethrin
0	0.945a[2]
1	0.460b
3	0.378b
7	0.213bc
10	0.083c
14	0.042c

1. Treated July 13, 21 and 28, 1987 at the rate of 0.07 kg active per hectare.

2. Means followed by the same letter are not significantly different (P=0.05) according to Duncan's Multiple Range Test.

CROP: Lettuce var. Ithaca

NAME AND AGENCY:
RITCEY, G., McIVER, S., and McEWEN, F.L.
Department of Environmental Biology
University of Guelph
Guelph, Ontario N1G 2W1
FRANK, R. and RIPLEY, B.
Provincial Pesticide Residue Testing Laboratory
University of Guelph
Guelph, Ontario N1G 2W1

TITLE: FUNGICIDE RESIDUE IN LETTUCE

MATERIALS: Rovral(R) 50 WP (iprodione).

METHODS: The tests were done at the Holland Marsh on muck soil. Eight-row plots, 15 metres long were planted with lettuce. The treatment was applied at a rate of 550 litres per hectare with a tractor-mounted sprayer. Iprodione was applied three times at the rate of 0.75 kg active per hectare. The crop was treated prior to harvest and sampled at various intervals during harvest maturity. Treatment was replicated four times. Samples were analyzed for residue (methods of analyses available on request).

RESULTS: Residue data are presented in Table 1.

CONCLUSIONS: The residue of iprodione declined rapidly with increased time after treatment. Residue was less than 1 mg/kg by day 7.

TABLE 1. Residue of iprodione in lettuce when the fungicide was applied three times prior to harvest[1].

Days after application	Residue in lettuce (mg/kg) iprodione
-1	0.133
0	13.50a[2]
1	5.75b
3	4.10b
7	0.856c
10	0.385c
14	0.188c
21	0.125c

1. Treated July 7, 17 and 29, 1987 at the rate of 0.75 kg active per hectare.
2. Means followed by the same letter are not significantly different (P=0.05) according to Duncan's Multiple Range Test.

CROP: Strawberry, Fragaria x ananassa cv. Totem

PEST: Chaetosiphon fragefolii (Cockerell)

TITLE: RESIDUES OF OXYDEMETON-METHYL IN STRAWBERRY

MATERIALS: METASYSTOX-R 2.4 SC (24% oxydemeton-methyl).

METHODS: A 0.11-ha field of strawberries at Abbotsford, B.C. was planted 29 April, 1987 with rows centered at 1.2 m and plants within row 0.6 m apart. Test plots consisted of 10 plants/row x 3 rows. The plots were separated between rows by a guard row and within rows by 6 guard plants. The METASYSTOX-R treatments (see table for rates) and the control were replicated 4 times in a randomized complete block design. These treatments represented 2 x, 1 x, and 1/2 x the U.S. recommended foliar application rate for a full crop canopy, but with only 1/2 the volume of spray applied due to the small size of the plants. Sprays were applied 15 May, 17 days after planting, 29 May, just prior to flowering, and 4 June, at which time all the plants had at least 1 flower open. Rain occurred 2 h after the 29 May spray but fair weather followed the other two sprays. A backpack sprayer primed to 210 kPa and a Teejet 8010LP drench nozzle was used to apply the material to the foliage and the soil between plants within a row. The strawberries were harvested 30 June and 7 July, and analyzed for total oxydemeton-methyl residues including its sulfone.

NAME AND AGENCY:
SZETO, S., D.A. RAWORTH AND S.J. CLEMENTS
Agriculture Canada, Research Station
Vancouver, British Columbia V6T 1X2

LOCATION: Abbotsford, British Columbia

RESULTS: The results are summarized in the table.

CONCLUSIONS: These data suggest that prebloom sprays of METASYSTOX-R will result in negligible oxydemeton-methyl residues (< 0.1 ppm fresh wt.). Further work may be required to assess residues from a full-rate prebloom spray in the first production year.

Rate of Oxydemeton-methyl application[1] (kg ai/ha)	Days from last spray date to sample date	Residues in ppm (fresh weight)
0.56	26	0.063
	33	0.014
0.28	26	0.039
	33	0.005
0.14	26	0.016
	33	0.002

[1]Dilution, 470 L water/ha.

CROP: Wheat (var. Neepawa)

TITLE: RESIDUES OF CARBARYL ON WHEAT FOLIAGE, STRAW AND GRAIN

MATERIALS: SEVIN XLR (carbaryl)

METHOD: Carbaryl was applied at 550 and 1100 g a.i./ha on July 21 to each of 4 replicates of wheat seeded on May 29 at the Research Station Farm, Saskatoon. Samples of foliage from the treated plots and untreated control plots were taken at 9 times after application. Samples of grain and straw were also collected at harvest on September 11. Wheat foliage, grain and straw were homogenized in acetonitrile and the filtrate purified on Florisil. The purified eluant was analysed by reverse phase liquid chromatography with acetonitrile - water mobile phase and ultraviolet detection.

NAME AND AGENCY:
WESTCOTT, N.D. and HAN DEYUAN*
Research Station, Agriculture Canada
107 Science Crescent
Saskatoon, Saskatchewan
S7N 0X2
(*Han Deyuan, visiting Scientist from Beijing Academy of Agriculture and Forestry, China)

RESULTS: The residues of carbaryl detected in foliage, straw and grain are presented in Table 1.

CONCLUSIONS: Residues decreased most rapidly during the first 11 days after application. At harvest, residues of carbaryl were detected in the straw but no residues were detected in the grain from either rate of application.

Table 1. Residues (ppm) of carbaryl in wheat foliage, straw and grain.

Sample	Days after Application	Concentration of carbaryl (ppm) (and st. dev) at 2 treatment rates	
		1120 g a.i./ha	550 g a.i./ha
Foliage	0	27.72 (6.74)	10.36 (0.85)
	1	21.79 (2.95)	6.84 (1.47)
	3	18.58 (3.30)	4.21 (0.46)
	7	7.97 (3.32)	1.06 (0.00)
	11	3.35 (0.91)	0.71 (0.00)
	18	0.64 (0.20)	0.20 (0.03)
	22	0.84 (0.54)	0.21 (0.06)
	25	0.60 (0.35)	0.37 (0.00)
	28	0.96 (0.72)	0.17 (0.00)
Straw	52	0.84 (0.15)	0.57 (0.07)
Grain	52	N.D.	N.D.

N.D. = Not Detected

Stored Products

Produits entreposés

Edited by / Révisé par
E.J. Bond

There were no reports for this section in 1987.

Il n'y a pas de rapports en 1987 pour cette section.

Basic Studies on Fungicides

Études de base sur les fongicides

There were no reports for this section in 1987.

Il n'y a pas de rapports en 1987 pour cette section.

List of Pesticides and Chemical Definitions

Liste des pesticides et définitions chimiques

LIST OF PESTICIDES AND CHEMICAL DEFINITIONS

Pesticide	Alternative Designation(s)
1,3-dichloropropene	TELONE; TELONE II-B
A-6213A	etaconazole
A-6214A	etaconazole
A-6221A	etaconazole
A-6222A	etaconazole
A-815	triflumizole
A0201	imazalil
AA GRANO DROOG-77	carbendazim + imazalil + quintozene
ABAMECTIN	avermectin b1
ABG-6149	*B. thuringiensis berliner*
ABG-6162A	thuringiensin
ABG-6198A	*B. thuringiensis berliner*
ABG-6228	thuringiensin
AC 290,230	AC-290230
AC 290,678	AC-290678
AC 801,352	AC-801352
AC-290230	AC 290,230
AC-290678	AC 290,678
AC-801352	AC 801,352
acephate	ORTHENE; TF-3553; TF-3670
acetic acid	VINEGAR
ACR-3453-A	ACR-3453A
ACR-3815	mancozeb + RO-15-1297
ACTIDIONE RZ	cycloheximide + quintozene
ACTIDIONE TGF	cycloheximide
ACTIDIONE THIRAM	cycloheximide + thiram
AFUGAN	pyrazophos
AG-SURF	AGSURF
AGRAL 90	nonylphenolethylene oxide
AGRI-MYCIN 17	streptomycin
AGRI-STREP	streptomycin
AGRIMYCIN 17	streptomycin
AGRISTREP	streptomycin
AGROSOL	captan + thiabendazole; AGROSOL FLOWABLE
AGROSOL FLOWABLE	AGROSOL
AGROSOL POUR-ON	thiram + thiabendazole; AGROSOL T
AGROSOL T	AGROSOL POUR-ON
AGROX	maneb
AGROX 16	mancozeb
AGROX B-3	B-3
AGROX C	ethylmercuric chloride + phenylmercuric acetate

AGROX D-L PLUS	captan + diazinon + lindane; AGROX DL PLUS
AGROX D-L-M	diazinon + lindane + metalaxyl
AGROX DB	maneb
AGROX DL PLUS	AGROX D-L PLUS
AGROX DUST	maneb
AGROX FLOWABLE	maneb
AGROX NM	maneb
AGROX POTATO SEED PIECE DUST	mancozeb
AGROX SEED PIECE DUST	mancozeb
AGROX-12	mancozeb
AGROX-16	mancozeb
AGSCO DB-GREEN	lindane + maneb; AGSCO DB GREEN
AGSCO DB-RED	lindane + maneb
AGSURF	AG-SURF
AH-87600	cypermethrin + diazinon
aldicarb	TEMIK
aldoxycarb	STANDAK; UBI-2496
ALIETTE	fosetyl-al
ALIETTE EXTRA	fosetyl-al + captan + thiabendazole
ALPHAMETHRIN	WL-85871
ALSYSTIN	triflumuron
aluminum phosphide	GASTOXIN; HYDROGEN PHOSPHIDE; PHOSPHINE; PHOSTOXIN
AMAZE	isofenphos
AMAZE SEED TREATER	carbendazim + isofenphos + thiram
AMBUSH	permethrin
AMIBEN	chloramben
amitraz	BAAM; MITAC
AMMO	cypermethrin
ammonium sulfate	ammonium sulphate
ammonium sulphamate	AMMATE; AMMONIUM SULFAMATE; AMS
ammonium sulphate	ammonium sulfate
ANCHOR	carbathiin + thiram; UBI-2359-1
anilazine	DYRENE
ANVIL	hexaconazole
APM	azinphos-methyl
APOLLO	clofentezine
APRON	metalaxyl
APRON 35	metalaxyl
APRON 350	captan + metalaxyl
APRON 70	captan + metalaxyl
APRON-FL	metalaxyl
AQUA	parathion
ARREST	carbathiin + oxycarboxin + thiram
ATROBAN	permethrin
ATROBAN DELICE POUR-ON	permethrin
ASSIST	surfactant
AVADEX	diallate

AVADEX BW	triallate
avermectin bl	ABAMECTIN; AVID; MK-936
AVID	avermectin bl
AXIS OIL	emulsifiable spray oil
AXIS SPRAY OIL	emulsifiable spray oil
azinphos-methyl	APM; GUTHION
B-3	captan + diazinon + lindane; AGROX B-3; CHIPMAN B-3
B. thuringiensis berliner	ABG-6149; ABG-6198A; SAN-415; *Bacillus thuringiensi*
B. thuringiensis berliner kurstaki	*B. thuringiensis kurstaki*
B. thuringiensis israelensis	VECTOBAC
B. thuringiensis kurstaki	*B. thuringiensis berliner kurstaki* *Bacillus thuringiensis kurstaki* BACTOSPEINE; BACTOSPEINE-A; DIPEL; DIPEL LDM; JAVELIN; THURICIDE-HPC
B. thuringiensis san diego	M-ONE
B.T. DELTA-EXOTOXINE	delta-exotoxin of b.t.
BAAM	amitraz
Bacillus thuringiensis	*B. thuringiensis berliner*
Bacillus thuringiensis kurstaki	*B. thuringiensis kurstaki*
BACTOSPEINE	*B. thuringiensis kurstaki*
BACTOSPEINE-A	*B. thuringiensis kurstaki*
BANNER	propiconazole
BAS-222	confidential
BAS-263	cloethocarb
BAS-276	benzamorf
BAS-389	furmecyclox
BAS-38905	furmecyclox
BAS-436	BAS-436-100F; BCI-100F
BAS-436-100F	BAS-436
BASAMID	dazomet
BAS-9053	confidential fungicide
BASF-166801	BASF-LAB-166801
BASF-LAB-166801	BASF-166801; LAB-166801
BASUDIN	diazinon
BAY-FCR-1272	cyfluthrin
BAY-HWG-1608	ETHYLTRIANOL; FOLICUR; HWG-1608
BAY-KWG-0519	triadimenol
BAY-NTN-19701	MONCEREN; NTN-19701
BAY-SAS-9244	SAS-9244
BAY-SIR-8514	triflumuron
BAY-SLJ-0312	FLUBENZAMINE; FLUBENZIMINE
BAYCOR	bitertanol
BAYLETON	triadimefon
BAYOFLY	cyfluthrin
BAYTAN	triadimenol
BAYTAN F	fuberidazole + triadimenol
BAYTAN UNIVERSAL	fuberidazole + imazalil + triadimenol

BAYTHROID	cyfluthrin
BCI-100F	BAS-436
BELMARK	fenvalerate
benalaxyl	GALBEN; TF-3651
bendiocarb	FICAM; TRUMPET
BENESAN	lindane
benfuracarb	ONCOL
BENLATE	benomyl
benodanil	CALIRUS
BENOLIN R	benomyl + lindane + thiram
BENOLIN R FS	carbendazim + lindane + thiram
benomyl	BENLATE
benzamorf	BAS-276
BETA-EXOTOXINE DE B.T.	thuringiensin
BHC	lindane
bifenthrin	BRIGADE; CAPTURE; FMC-54800; TALSTAR
BILOXAZOL	bitertanol
BIRLANE	chlorfenvinphos
bitertanol	BAYCOR; BILOXAZOL
BLADEX	cyanazine
BLOC	fenarimol
BLOTIC	propetamphos
BORDEAUX MIXTURE	calcium hydroxide + copper sulphate
BOTRAN	dichloran
BOVAID	fenvalerate
BR-83 SLURRY	lindane
BRAVO	chlorothalonil
BRAVO 500	chlorothalonil
BRAVO 720	chlorothalonil
BRAVO 90DG	chlorothalonil
BRAVO S	chlorothalonil + sulphur
BRAVOSAN	chlorothalonil + oxadixyl
BRIGADE	bifenthrin
brodifacoum	VOLID
BROOT	trimethacarb
bupirimate	NIMROD
BUSAN	TCMTB
BUSAN 30	TCMTB
C-I-L LAWN FOOD AND INSECT CONTROL	chlorpyrifos
C-I-L LAWN FUNGICIDE	chlorothalonil
CAG-1009	benomyl + thiram
CAG-1013	benomyl + thiram
CALIRUS	benodanil
CALIXIN	tridemorph
CAN-O-JET	CANO-O-JET
CANO-O-JET	CAN-O-JET
CANOCOTE COMMERCIAL COAT	methyl cellulose
CANOCOTE MICROPELLET	methyl cellulose
capsaicin	HOT SAUCE

captafol	DIFOLATAN
captan	ORTHOCIDE
CAPTURE	bifenthrin
carbaryl	SEVIN; SEVIN XLR; UCSF-27; UCSF-40
carbathiin	UBI-1373; UBI-2092; UBI-2100; UBI-2100-2; UBI-2106; UBI-2151; UBI-2406; UBI-2408; UBI-2436-1; UBI-2492; VITAFLO 250; VITAVAX; VITAVAX 2100; VITAVAX 75W; VITAVAX SOLUTION
carbendazim	DELSENE; DPX-965; MBC
carbofuran	FURADAN; FURADAN 350; FURADAN CR-10
CARGILL 579-65-B	triadimenol
CARGILL 579-65-I	lindane + triadimenol
CARPOVIRUSINE	granulosis virus
CARZOL	formetanate
CD-351	mineral oil-adjuvant
CD-352	mineral oil-adjuvant
CD-353	mineral oil-adjuvant
CD-353A	mineral oil-adjuvant
CERONE	ethephon
CGA-449	confidential
CGA-453	confidential
CGA-41333	imazalil
CGA-6207	CGA-6207B
CGA-6207B	CGA-6207
CGA-6214A	etaconazole
CGA-6222A	etaconazole
CGA-64250	propiconazole
CGA-64251	etaconazole
CGA-71818	confidential
CGA-72662	cyromazine
CGA-73102	furathiocarb
CGF-4280	NNF-136
CGF-4320	unknown
chinomethionat	MORESTAN
CHIPMAN B-3	B-3
chloramben	AMIBEN
chlordane	ASPON; BELT; CHLORDAN
chlordimeform	FUNDAL; GALECRON; SPANONE
chlorfenvinphos	BIRLANE
CHLORINE BLEACH	sodium hypochlorite
chlormequat	CYCOCEL; CYCOCEL EXTRA
chloroneb	TERSAN SP
chlorophacinone	ROZOL
chlorothalonil	BRAVO; BRAVO 500; BRAVO 720; BRAVO 90DG; C-I-L LAWN FUNGICIDE; DACONIL; DACONIL 2787; TF-9021

chlorpyrifos	C-I-L LAWN FOOD AND INSECT CONTROL; DURSBAN; LORSBAN
chlorsulfuron	GLEAN
CITCOP	copper salts of rosin and fatty acids
CITOWETT PLUS	ALKYLARYL POLYG; BASF CITOWETT; CITOWETT; COL ETHER
cloethocarb	BAS-263; LANCE
clofentezine	APOLLO; NC-21314
CO-6054	METOMECLAN; TF-3693
codling moth granulosis virus	granulosis virus
concentre d'huile	mineral oil-insecticide
COOP GOLDEN FLY BAIT	methomyl + muscalure
COPAC	copper
copper	COPAC
copper oxychloride	MICROCOP-50; NIAGARA FIXED COPPER
COPPER SPRAY	tribasic copper sulphate
copper sulphate	copper sulfate
CORBEL	fenpropimorph
COUNTER	terbufos
cupric hydroxide	COPPER HYDROXIDE; KOCIDE
cyanazine	BLADEX
cycloheximide	ACTIDIONE TGF
CYCOCEL	chlormequat
CYCOCEL EXTRA	chlormequat
cyfluthrin	BAY-FCR-1272; BAYOFLY; BAYTHROID
CYGON	dimethoate
cyhalothrin	KARATE; PP-321
cyhexatin	PLICTRAN
CYMBUSH	cypermethrin
cypermethrin	AMMO; CYMBUSH; DEMON; INSECTIPEN; RIPCORD; STOCKAID
CYPREX	dodine
cyromazine	CGA-72662; LARVADEX; TRIGARD
CYTHION	malathion
D-D	1,2-dichloropropane + 1,3-dichloropropene
DACONIL	chlorothalonil
DACONIL 2787	chlorothalonil
DANITOL	fenpropathrin
DASANIT	fensulfothion
dazomet	BASAMID
DECIS	deltamethrin
DEF	S,S,S-tributyl phosphorothioate
DELSENE	carbendazim
delta-exotoxin of b.t.	B.T. DELTA-EXOTOXINE; EG-2158
deltamethrin	DECIS
demeton	SYSTOX
DEMON	cypermethrin
DEXON	fenaminosulf

DI-BETA	thuringiensin
DI-SYSTON	disulfoton
diallate	AVADEX
diatomaceous earth	diatomaceous silica
diazinon	BASUDIN; DIAZOL; TF-5304
DIAZOL	diazinon
DIBROM	naled
dichlone	PHYGON
dichloran	BOTRAN
dichlorvos	VAPONA NO-PEST STRIP
diclofop-methyl	HOE-GRASS
dicofol	KELTHANE
diflubenzuron	DIMILIN
DIFOLATAN	captafol
diiodomethyl-para-tolyl sulphone	GUS-2000; GUS-4002
DIKAR	dinocap + mancozeb
dimethoate	CYGON; FMC; FMC-267; SYS-TEM
DIMILIN	diflubenzuron
diniconazole	XE-779
dinocap	KARATHANE
dinoseb	DOW POTATO TOPKILLER
DIPEL	*B. thuringiensis kurstaki*
DIPEL LDM	*B. thuringiensis kurstaki*
diphacinone	RAMIK BRUN
diphenamid	ENIDE
diphenylamine	DPA
disulfoton	DI-SYSTON
DITHANE F-45	mancozeb
DITHANE M-22	maneb
DITHANE M-45	mancozeb
dodemorph	MELTATOX
dodine	CYPREX; EQUAL
DOW POTATO TOPKILLER	dinoseb
DOWCO-429X	DOWCO-429
DOWCO-429	XRD-42; DOWCO-429X
DOWCO-444	DOW-444
DOWCO-473	XRD-473
DOWICIDE A	sodium 2-phenylphenoxide
DPA	diphenylamine
DPX-4424	procymidone
DPX-965	carbendazim
DPX-H6573	flusilazole
DPX-Y5893	hexythiazox
DRIE-DIE NO. 67	silica aerogel
DS-57654	chlorothalonil + nuarimol
DS-64220	chlorothalonil + copper
DS-64221	chlorothalonil + copper
DURSBAN	chlorpyrifos
DYFONATE	fonofos

DYFONATE ST	fonofos
DYLOX	trichlorfon
DYRENE	anilazine
EASOUT	thiophanate-methyl
EASOUT POTATO SEED PIECE TREATMENT	diazinon + thiophanate-methyl
ECTIBAN	permethrin
EF-453	chlorpyrifos + cypermethrin
EFOSITE	fosetyl
EFOSITE-AL	fosetyl-al
EG-2158	delta-exotoxin of b.t.
EKALUX	quinalphos
EKALUX FORTE	quinalphos
EL-11-1C-223	nuarimol
EL-222	fenarimol
EL-228	nuarimol
EL-228/FN-5116	nuarimol
EL-228/IIIC-223-2	nuarimol
EL-494	L-794
EL-5261	ethalfluralin + trifluralin
EL-FN-5116	nuarimol
EL-FN-7011	nuarimol
EL228/FN5058	nuarimol
EL228/FN5116	nuarimol
emulsifiable spray oil	AXIS OIL; AXIS SPRAY OIL; SUNSPRAY
endosulfan	THIODAN
ENHANCE	surfactant
ENIDE	diphenamid
EPIC	furmecyclox
EPTC	EPTAM
EPTC PLUS	EPTC + R-25788; ERADICANE
EQUAL	dodine
ERADICANE	EPTC PLUS
ET-611	cypermethrin + diazinon
ET-696	cypermethrin + diazinon
etaconazole	A-6213A; A-6214A; A-6221A; A-6222A; CGA-6214A; CGA-6222A; CGA-64251; VANGARD
ethalfluralin	SONALAN
ethephon	CERONE; MATURE-AID
ethion	DIETHION; NIALATE
ethirimol	MILGO E; MILSTEM
ETHYLTRIANOL	BAY-HWG-1608
etridiazole	TRUBAN
EVERSHIELD	captan + malathion
EVISECT	thiocyclam-hydrogenoxalate
famphur	WARBEX
FASTAC	WL-85871
fenaminosulf	DEXON; LESAN
fenamiphos	NEMACUR; NEMACUR 3

fenarimol	BLOC; EL-222; RUBIGAN
fenbutatin oxide	TORQUE; VENDEX
fenitrothion	SUMITHION
fenoxycarb	RO-13-5223
fenpropathrin	DANITOL; WL-41706
fenpropimorph	CORBEL; M&B-83; MISTRAL
fensulfothion	DASANIT
fenthion	SPOTTON
fenvalerate	BELMARK; BOVAID
ferbam	FERMATE
FERMATE	ferbam
FICAM	bendiocarb
fluazifop-butyl	FUSILADE
flucythrinate	AC-222705; CYBOLT; GUARDIAN; PAY-OFF
flusilazole	DPX-H6573; NUSTAR
FLUTOLANIL	NNF-136
flutriafol	PP-450; TF-3673; TF-3674; TF-3739; TF-3752; TF-3753
fluvalinate	MAVRIK
FMC	dimethoate
FMC-267	dimethoate
FMC-54800	bifenthrin
FN-5116	nuarimol
FOLICUR	BAY-HWG-1608
folpet	PHALTAN
fonofos	DYFONATE; DYFONATE ST
formaldehyde	FORMALIN
FORMALIN	formaldehyde
formetanate	CARZOL
FORTRESS	SD-208304
fosetyl	EFOSITE
fosetyl-al	ALIETTE; EFOSITE-AL
FR 1218/1	fenpropimorph + iprodione
FR-1069	iprodione + lindane; FR-1069/1
FR-1069/1	FR-1069
FR-1218-1	fenpropimorph + iprodione
FRIGATE	mineral oil-insecticide
FUNGAFLOR	imazalil
FUNGAZIL	imazalil
FUNGIFLOR	imazalil
FUNGINEX	triforine
FURADAN	carbofuran
FURADAN 350	carbofuran
FURADAN CR-10	carbofuran
FURADAN F1 SEED TREATER	FURADAN SEED TREATER
FURADAN SEED TREATER	carbendazim + carbofuran + thiram; FURADAN F1 SEED TREATER; FURADAN ST
FURADAN ST	FURADAN SEED TREATER
furathiocarb	CGA-73102; PROMET

FURAVAX	methfuroxam
furmecyclox	BAS-389; BAS-38905; EPIC; TF-3545
FUSILADE	fluazifop-butyl
GALBEN	benalaxyl
GAMMASAN	lindane
GAMMASAN PLUS	benomyl + captan + lindane
GARDO	lindane
GLEAN	chlorsulfuron
GRANOX NM	maneb + thiabendazole
granulosis virus	CARPOVIRUSINE; codling moth granulosis virus
guazatine	PANOCTINE
GUS-2000	diiodomethyl-para-tolyl sulphone
GUS-2420	imazalil
GUS-371	oxadixyl
GUS-4002	diiodomethyl-para-tolyl sulphone
GUS-4013	metalaxyl
GUS-4043	triadimenol
GUS-4551	oxadixyl
GUS-4700	thiophanate-methyl
GUS-80502	thiodicarb
GUTHION	azinphos-methyl
hexaconazole	ANVIL; PP-523
hexythiazox	DPX-Y5893; SAVEY
HILLESHOG COMMERCIAL COAT	methyl cellulose
HILLESHOG MICROPELLET	methyl cellulose
HINDER	REPEL
HOE-000388	confidential
HOE-000522	teflubenzuron
HOE-GRASS	diclofop-methyl
HOT SAUCE	capsaicin
HWG-1608	BAY-HWG-1608
hydramethylnon	MAXFORCE
hymexazol	TACHIGAREN
imazalil	A0201; CGA-41333; FUNGAFLOR; FUNGAZIL; FUNGIFLOR; GUS-2420; TF-3733; UBI-2420
IMIDAN	phosmet
INSECTIPEN	cypermethrin
INSECTO	diatomaceous earth + honey + sugars
INSEGAR	RO-13-5223
iprodione	ROVRAL; ROVRAL FLO; ROVRAL GREEN
isofenphos	AMAZE; OFTANOL; TF-9031
ivermectin	IVOMEC
IVOMEC	ivermectin
JAVELIN	*B. thuringiensis kurstaki*
KARATE	cyhalothrin
KARATHANE	dinocap
kasugamycin	KASUMIN
kasumin-bordeaux	copper oxychloride + kasugamycin

KELTHANE	dicofol
KEMIRA-9051-1	carbathiin + carbendazim + imazalil
KEMIRA-9051/3A	carbathiin + carbendazim + imazalil
KOCIDE 101	copper + cupric hydroxide
KRYOCIDE	sodium aluminum fluoride
KUMULUS S	sulphur
KWG-0519	triadimenol
LAB-166801	BASF-LAB-166801
LANCE	cloethocarb
LANNATE	methomyl
LARVADEX	cyromazine
LARVIN	thiodicarb
LATERS LEAF SHINE	confidential
LC-477	surfactant
LENTAGRAN	pyridate
LESAN	fenaminosulf
lindane	BENESAN; BHC; BR-83 SLURRY; GAMMASAN; GARDO; PFIZER; STOCKPEST
LORSBAN	chlorpyrifos
LORSBAN 20	captan + chlorpyrifos
M&B FLOWABLE SULPHUR	sulphur
M&B MICRO-NIASUL	sulphur
M&B-83	fenpropimorph
M-ONE	*B. thuringiensis san diego*
malathion	CYTHION
mancozeb	AGROX 16; AGROX POTATO SEED PIECE DUST; AGROX SEED PIECE DUST; AGROX-12; AGROX-16; DITHANE F-45; DITHANE M-45; MANZATE 200; TF-3664; TF-3664 SEED PIECE TREATMENT; TF-3692; TF-3710; TUBERSEAL
maneb	AGROX; AGROX DB; AGROX DUST; AGROX FLOWABLE; AGROX NM; DITHANE M-22; MANZATE; TF-3591
MANZATE	maneb
MANZATE 200	mancozeb
MATURE-AID	ethephon
MAVRIK	fluvalinate
MAXFORCE	hydramethylnon
MBC	carbendazim
MELTATOX	dodemorph
MEPRONIL	SDS-45037
MERGAMMA DB	ethylmercuric chloride + lindane + phenylmercuric acetate
MERGAMMA NM	lindane + maneb
MERSIL	mercuric chloride + mercurous chloride
MERTECT	thiabendazole
MESUROL	methiocarb

metalaxyl	APRON; APRON 35; APRON-FL; GUS-4013; RIDOMIL; SUBDUE; TF-3740; UBI-2379; UBI-2461
metam-sodium	VAPAM
METASYSTOX-R	oxydemeton-methyl
methamidophos	MONITOR
methfuroxam	FURAVAX
methidathion	SUPRACIDE
methiocarb	MESUROL
methomyl	LANNATE
methoxychlor	MARLATE; METHOXY-DDT
methyl bromide	METH-O-GAS
methyl cellulose	CANOCOTE COMMERCIAL COAT; CANOCOTE MICROPELLET; HILLESHOG COMMERCIAL COAT; HILLESHOG MICROPELLET
metiram	POLYRAM
METOMECLAN	CO-6054
metribuzin	SENCOR; SENCOR 500
mevinphos	PHOSDRIN
mexacarbate	UCZF-14; UCZF-15; ZECTRAN
MGK-264	MGK 264
MICOGEN	unknown
MICRO-MIST	KELP EXTRACT
MICRO-NIASUL	sulphur
MICROCOP-50	copper oxychloride
MICROSCOPIC SULPHUR	sulphur
MILCAP	captafol + ethirimol
mineral oil-adjuvant	CD-351; CD-352; CD-353; CD-353A
mineral oil-insecticide	CONCENTRE D HUILE; FRIGATE; OIL CONCENTRATE
MINTOX	methoxychlor + potassium oleate
MISTRAL	fenpropimorph
MITAC	amitraz
MK-936	avermectin b1
molybdenum	MOLY
MONCEREN	BAY-NTN-19701
MONCUT	NNF-136
MONITOR	methamidophos
MORESTAN	chinomethionat
MOUSE BAIT	zinc phosphide
muscalure	CIS-9 TRICOSENE; MUSCAMONE; Z-9 TRICOSENE
myclobutanil	RH-3866; SYSTHANE; UBI-2454; UBI-2497
naled	DIBROM
NC-21314	clofentezine
NC-28410	confidential
NEMACUR	fenamiphos
NEMACUR 3	fenamiphos

NIAGARA FIXED COPPER	copper oxychloride
nicotine	NICOTINE SULPHATE
NICOTINE SULPHATE	nicotine
NIMROD	bupirimate
NNF-136	CGF-4280; FLUTOLANIL; MONCUT
NO-DAMP	oxine benzoate
nonylphenolethylene oxide	AGRAL 90
NTN-19701	BAY-NTN-19701
nuarimol	EL-11-1C-223; EL-228; EL-228/FN-5116; EL-228/IIIC-223-2; EL-FN-5116; EL-FN-7011; EL228/FN5058; EL228/FN5116; FN-5116; TF-3582; TF-3610; TF-3611; TF-3619; TF-3644; TF-3645; TF-3646; TF-3672; TRIMIDOL
NURELLE	chlorpyrifos + cypermethrin
NUSTAR	flusilazole
OFTANOL	isofenphos
OIL CONCENTRATE	mineral oil-insecticide
OKANAGAN DORMANT OIL	OKANAGAN OIL
OKANAGAN OIL	OKANAGAN DORMANT OIL
OMITE	propargite
ONCOL	benfuracarb
ORTHENE	acephate
ORTHOCIDE	captan
OSECO REGENT	VITAVAX RS
oxadixyl	GUS-371; GUS-4551; SAN-371
oxamyl	VYDATE
oxine benzoate	NO-DAMP
oxine-copper	COPPER 8-QUINOLINOLATE; COPPER OXYQUINOLATE; COPPER OXYQUINOLINOLEATE; OXYQUINOLATE DE CUIVRE; OXYQUINOLINOLEATE DE CUIVRE
oxycarboxin	PLANTVAX
oxydemeton-methyl	METASYSTOX-R
oxyfenthiin	P-368; UBI-P368
P-368	oxyfenthiin
paclobutrazol	PP-333
PANOCTINE	guazatine
PANOCTINE PLUS	guazatine + imazalil
parathion	AQUA
PCNB	quintozene
penconazole	TOPAS
PERMECTRIN	permethrin
permethrin	AMBUSH; ATROBAN; ATROBAN DELICE POUR-ON; ECTIBAN; PERMECTRIN; PORON; POUNCE; SANBAR
PFIZER	lindane
PHALTAN	folpet

phenylmercuric acetate	PMAS; SCOTTS F96; SCOTTS S804
PHEROCON AM	attractant
phorate	THIMET
phosalone	ZOLONE
PHOSDRIN	mevinphos
phosmet	IMIDAN
PHYGON	dichlone
pirimicarb	PIRIMOR
PIRIMOR	pirimicarb
PLANTVAX	oxycarboxin
PLICTRAN	cyhexatin
PMAS	phenylmercuric acetate
POAST	sethoxydim
polybutene-5	THRIPSTICK II
POLYRAM	metiram
polyram-diazinon	diazinon + polyethylene thiuram disulphide + zineb
PORON	permethrin
potassium oleate	SAFERS INSECTICIDAL SOAP; SAFERS SOAP
potassium sulfate	potassium sulphate
potassium sulphate	potassium sulfate
POUNCE	permethrin
PP-321	cyhalothrin
PP-333	paclobutrazol
PP-450	flutriafol
PP-523	hexaconazole
PP-993	tefluthrin
PREVICUR-N	propamocarb
PRO GRO	PRO GRO SYSTEMIC SEED PROTECTANT
PRO GRO SYSTEMIC SEED PROTECTANT	carbathiin + thiram; PRO GRO
prochloraz	SPORTAK
PROCURE	triflumizole
procymidone	DPX-4424
PROMET	furathiocarb
propamocarb	PREVICUR-N
propanil	STAMPEDE
propargite	OMITE
propetamphos	BLOTIC
propiconazole	BANNER; CGA-64250; TILT
propoxur	BAYGON; CRAWLTOX; UNDEN
PROTURF FFII	quintozene
PROTURF FUNGICIDE VII	triadimefon
pyrazophos	AFUGAN
pyridate	LENTAGRAN
pyroxyfur	TF-3724
Q-5177	carbathiin + imazalil + oxine-copper
quinalphos	EKALUX; EKALUX FORTE
quintozene	PCNB; PROTURF FFII; SCOTTS FF II; SCOTTS FFII; SCOTTS LAWN DISEASE PREVENTER; TERRACHLOR; TERRACLOR

RAMIK BRUN	diphacinone
RAPCOL	furathiocarb + metalaxyl + thiram
RE-26940	CHEVRON 26940; RE 26940
repulsif a rongeur	thiram
RH-3866	myclobutanil
RH-5781	confidential
RH-5781F	RH-5781
RH-5782	unknown
RH-7592	unknown fungicide
RHC-376	confidential
RHC-377	confidential
RIDOMIL	metalaxyl
RIDOMIL MZ	mancozeb + metalaxyl
RIPCORD	cypermethrin
RIZOLEX	tolclofos-methyl
RO-13-5223	fenoxycarb; INSEGAR
RO-15-1297	confidential
RONILAN	vinclozolin
ROVRAL	iprodione
ROVRAL FLO	iprodione
ROVRAL GREEN	iprodione
ROVRAL PLUS	iprodione + lindane
ROVRAL ST	iprodione + lindane
ROZOL	chlorophacinone
RTU 7-15	triadimenol
RTU-800B	triadimenol
RUBIGAN	fenarimol
S-3349	tolclofos-methyl
SAFERS ID	diazinon + potassium oleate
SAFERS INSECTICIDAL SOAP	potassium oleate
SAFERS NATURAL GARDEN FUNGICIDE CONC.	SAFERS NGF
SAFERS NGF	SAFERS NATURAL GARDEN FUNGICIDE CONC.
SAFERS SOAP	potassium oleate
SAN-155	thiocyclam-hydrogenoxalate
SAN-371	oxadixyl
SAN-415	*B. thuringiensis*
SAN-485	unknown
SAN-518	mancozeb + oxadixyl
SAN-553	copper + folpet + oxadixyl
SANBAR	permethrin
SAP-404	potassium oleate + pyrethrins
SAS-9244	BAY-SAS-9244
SAVEY	hexythiazox
SCOOT	thiram
SCOTTS F VII	triadimefon
SCOTTS F8359	triadimefon
SCOTTS F96	phenylmercuric acetate
SCOTTS FF II	quintozene
SCOTTS FFII	quintozene

SCOTTS FUNGICIDE VII	triadimefon
SCOTTS LAWN DISEASE PREVENTER	quintozene
SCOTTS S804	phenylmercuric acetate
SD-208304	FORTRESS
SDS-45037	MEPRONIL
SENCOR	metribuzin
SENCOR 500	metribuzin
sethoxydim	POAST
SEVIN	carbaryl
SEVIN XLR	carbaryl
SHOK	piperonyl butoxide + natural pyrethroids
silica aerogel	DRIE-DIE NO. 67
simazine	GESATOP; PRIMATOL S; PRINCEP
SN-72129	THIANITRIL
SN-84364	confidential fungicide
sodium 2-phenylphenoxide	DOWICIDE A
sodium aluminum fluoride	KRYOCIDE
sodium hypochlorite	CHLORINE BLEACH
sodium molybdate	ANHYDROUS SODIUM MOLYBDATE
SOLACOL	validamycin a
SONALAN	ethalfluralin
SPORTAK	prochloraz
SPOTLESS	XE-779
SPOTTON	fenthion
STAMPEDE	propanil
STANDAK	aldoxycarb
STOCKAID	cypermethrin
STOCKPEST	lindane
streptomycin	AGRI-MYCIN 17; AGRI-STREP; AGRIMYCIN 17; AGRISTREP
SUBDUE	metalaxyl
sulphur	KUMULUS S; M&B FLOWABLE SULPHUR; M&B MICRO-NIASUL; MICRO-NIASUL; MICROSCOPIC SULPHUR; THIOLUX; WETTABLE SULPHUR
SUMITHION	fenitrothion
SUNSPRAY	emulsifiable spray oil
superior oil	TF-5081
SUPRACIDE	methidathion
SYS-TEM	dimethoate
SYSTHANE	myclobutanil
SYSTOX	demeton
TACHIGAREN	hymexazol
talc	MAGNESIUM SILICATE
TALSTAR	bifenthrin
TBZ	thiabendazole
TCMTB	BUSAN; BUSAN 30
teflubenzuron	HOE-000522; HOE-00522

tefluthrin	PP-993; TF-3648; TF-3661; TF-3695; TF-3722; TF-3754; TF-3755; TF-5291
TELONE	1,3-dichloropropene
TELONE II-B	1,3-dichloropropene
TEMIK	aldicarb
terbufos	COUNTER
TERRACHLOR	quintozene
TERRACLOR	quintozene
TERSAN SP	chloroneb
TF-3061	maneb + phosmet
TF-3467	captan + terbuthylazine
TF-3479	triadimenol
TF-3479B	triadimenol
TF-3480	triadimenol
TF-3481	triadimenol
TF-3482	lindane + triadimenol
TF-3483	lindane + triadimenol
TF-3486	captan + chlorpyrifos
TF-3488	captan + chlorpyrifos
TF-3492	chlorpyrifos + maneb
TF-3506	sodium molybdate + captan + terbuthylazine
TF-3508	carbendazim + lindane + thiram
TF-3509	captan + triadimenol
TF-3533	lindane + thiram
TF-3538	maneb + triadimenol
TF-3539	maneb + triadimenol
TF-3540	maneb + triadimenol
TF-3545	furmecyclox
TF-3552	captan + isofenphos
TF-3553	acephate
TF-3554	acephate + captan
TF-3560	maneb + thiabendazole
TF-3561	maneb + thiabendazole
TF-3566	captan + thiabendazole
TF-3582	nuarimol
TF-3585	lindane + nuarimol
TF-3586	lindane + nuarimol
TF-3591	maneb
TF-3592	benalaxyl + captan + molybdenum
TF-3595	terbuthylazine + thiram
TF-3603	isofenphos + maneb
TF-3607	lindane + thiabendazole + thiram
TF-3609	captan + tefluthrin
TF-3610	nuarimol
TF-3611	nuarimol
TF-3618	captan + chlorpyrifos + lindane
TF-3619	nuarimol
TF-3620	captan + thiabendazole

TF-3621		benalaxyl + captan + molybdenum
TF-3627		trimethacarb
TF-3632		benomyl + captan + lindane
TF-3643		captan + isofenphos
TF-3644		nuarimol
TF-3645		nuarimol
TF-3646		nuarimol
TF-3647		benalaxyl + diazinon + lindane
TF-3648		tefluthrin
TF-3651		benalaxyl
TF-3656		imazalil + triadimenol
TF-3658		maneb + triadimenol
TF-3659		maneb + triadimenol
TF-3660		maneb + triadimenol
TF-3661		tefluthrin
TF-3664		mancozeb
TF-3664	SEED PIECE TREATMENT	mancozeb
TF-3670		acephate
TF-3672		nuarimol
TF-3673		flutriafol
TF-3674		flutriafol
TF-3678		lindane + maneb
TF-3682		bendiocarb + captan
TF-3686		benalaxyl + molybdenum
TF-3689		imazalil + triadimenol
TF-3690		imazalil + triadimenol
TF-3691		mancozeb + triadimenol
TF-3692		mancozeb
TF-3693		CO-6054
TF-3694		imazalil + mancozeb
TF-3695		tefluthrin
TF-3696		isofenphos + mancozeb
TF-3697		isofenphos + mancozeb
TF-3698		lindane + mancozeb
TF-3699		lindane + mancozeb
TF-3700		captan + CO-6054 + lindane
TF-3701		captan + carbendazim + isofenphos
TF-3702		captan + imazalil + lindane
TF-3703		captan + imazalil + lindane
TF-3704		captan + isofenphos
TF-3705		imazalil + mancozeb
TF-3710		mancozeb
TF-3719		flutriafol + lindane
TF-3720		flutriafol + lindane
TF-3721		chlorpyrifos + mancozeb + tefluthrin
TF-3722		tefluthrin
TF-3723		benalaxyl + imazalil
TF-3724		pyroxyfur
TF-3725		pyroxyfur + thiram

TF-3726	pyroxyfur + thiram + thiabendazole
TF-3727	flutriafol + isofenphos
TF-3728	flutriafol + isofenphos
TF-3729	triadimenol + isofenphos
TF-3730	triadimenol + isofenphos
TF-3731	imazalil + mancozeb
TF-3733	imazalil
TF-3738	triadimenol
TF-3739	flutriafol
TF-3740	metalaxyl
TF-3741	metalaxyl + thiram
TF-3742	metalaxyl + thiabendazole + thiram
TF-3752	flutriafol
TF-3753	flutriafol
TF-3754	tefluthrin
TF-3755	tefluthrin
TF-3759	flutriafol + lindane
TF-3760	flutriafol + lindane
TF-5291	tefluthrin
TF-5304	diazinon
TF-9021	chlorothalonil
TF-9031	isofenphos
thiabendazole	MERTECT; TBZ; UBI-2395; UBI-2395-1
THIMET	phorate
thiocyclam-hydrogenoxalate	EVISECT; SAN-155
THIODAN	endosulfan
thiodicarb	GUS-80502; LARVIN
THIOLUX	sulphur
thiophanate-methyl	EASOUT; GUS-4700
thiram	REPULSIF A RONGEUR; SCOOT; TMTD
THIS FLOWABLE COPPER SULPHUR	copper + sulphur
THIS IRON WITH SULPHUR	iron + sulphur
THRIPSTICK II	polybutene-5
THURICIDE-HPC	*B. thuringiensis kurstaki*
thuringiensin	ABG-6162A; ABG-6228; BETA-EXOTOXINE DE B.T.; DI-BETA
TILT	propiconazole
TILT-MANCOZEB FORMULATED MIXTURE	mancozeb + propiconazole
TMTD	thiram
tolclofos-methyl	RIZOLEX; S-3349
TOPAS	penconazole
TOPAS MZ	mancozeb + penconazole
TOPAS/MANZATE	maneb + penconazole
TORQUE	fenbutatin oxide
TREFLAN	trifluralin
triadimefon	BAYLETON; PROTURF FUNGICIDE VII; SCOTTS F VII; SCOTTS F8359; SCOTTS FUNGICIDE VII

triadimenol	BAY-KWG-0519; BAYTAN; CARGILL 579-65-B; GUS-4043; KWG-0519; RTU 7-15; RTU-800B; TF-3479; TF-3479B; TF-3480; TF-3481; TF-3738; UBI-2383; UBI-2383-1
triallate	AVADEX BW
tribasic copper sulphate	COPPER SPRAY
trichlorfon	DYLOX
tridemorph	CALIXIN
triflumizole	A-815; PROCURE; UBI-1716; UBI-2342; UBI-2391; UBI-A-815; UBI-A815
triflumuron	ALSYSTIN; BAY-SIR-8514
trifluralin	TREFLAN
triforine	FUNGINEX
TRIGARD	cyromazine
trimethacarb	BROOT; TF-3627; UC27-BF-32
TRIMIDOL	nuarimol
TRI-PAK	ammonium sulphamate + ASSIST + sethoxydim
TRITON B 1956	surfactant
TRITON X-100	surfactant
TRITON XR	surfactant
TRUBAN	etridiazole
TRUMPET	bendiocarb
TUBERSEAL	mancozeb
UBI-1196	VITAVAX 200
UBI-1373	carbathiin
UBI-1556	carbathiin + thiabendazole
UBI-1592	carbathiin + imazalil + thiabendazole
UBI-1664	carbathiin + maneb; UBI-1664-R
UBI-1664-R	UBI-1664
UBI-1716	triflumizole
UBI-1759	UBI-A-920; UBI-A92; UBI-A920
UBI-2051	VITAFLO 280
UBI-2092	carbathiin
UBI-2100	carbathiin
UBI-2100-2	carbathiin
UBI-2106	carbathiin
UBI-2151	carbathiin
UBI-2155	carbathiin + thiram
UBI-2235	carbathiin + thiram
UBI-2342	triflumizole
UBI-2344	carbathiin + lindane + thiram
UBI-2359	carbathiin + thiram
UBI-2359-1	ANCHOR
UBI-2365	carbathiin + thiram
UBI-2369	VITAVAX RS
UBI-2369-1	VITAVAX RS
UBI-2374	carbathiin + imazalil
UBI-2375	carbathiin + triflumizole

UBI-2376	carbathiin + thiram + UBI-1759
UBI-2377	carbathiin + thiram + UBI-1759
UBI-2379	metalaxyl
UBI-2382	carbathiin + oxycarboxin + oxadixyl
UBI-2383	triadimenol
UBI-2383-1	triadimenol
UBI-2389	carbathiin + isofenphos
UBI-2390	carbathiin + thiram UBI-2390-1
UBI-2390-1	UBI-2390
UBI-2391	triflumizole
UBI-2392	carbathiin + triflumizole
UBI-2393	carbathiin + thiabendazole; UBI-2393-1; UBI-2393-2
UBI-2393-1	UBI-2393
UBI-2393-2	UBI-2393
UBI-2394	carbathiin + imazalil + thiabendazole; UBI-2394-1; UBI-2394-2
UBI-2394-1	UBI-2394
UBI-2394-2	UBI-2394
UBI-2395	thiabendazole
UBI-2395-1	thiabendazole
UBI-2398	carbathiin + triflumizole
UBI-2401	carbathiin + imazalil; UBI-2401-1
UBI-2401-1	UBI-2401
UBI-2402	carbathiin + lindane + thiabendazole; UBI-2402-1
UBI-2402-1	UBI-2402
UBI-2403	carbathiin + imazalil + lindane
UBI-2404	carbathiin + imazalil
UBI-2405	carbathiin + lindane + thiophanate-methyl
UBI-2406	carbathiin
UBI-2408	carbathiin
UBI-2409	carbathiin + lindane + metalaxyl + thiophanate-methyl
UBI-2410	carbathiin + lindane
UBI-2413	carbathiin + isofenphos + thiram; UBI-2413-1
UBI-2413-1	UBI-2413
UBI-2414	carbathiin + isofenphos + thiram
UBI-2415	carbathiin + thiodicarb + thiram
UBI-2416	carbathiin + thiophanate-methyl
UBI-2417	carbathiin + lindane + metalaxyl; UBI-2417-1
UBI-2417-1	UBI-2417
UBI-2420	imazalil
UBI-2421	UBI-G696
UBI-2422	carbathiin + lindane + thiram; UBI-2422-1

UBI-2422-1	UBI-2422
UBI-2424	carbathiin + imazalil
UBI-2435	carbathiin + thiram; UBI-2435-1
UBI-2435-1	UBI-2435
UBI-2436-1	carbathiin
UBI-2446	carbathiin + imazalil
UBI-2451	carbathiin + metalaxyl + thiabendazole
UBI-2454	myclobutanil
UBI-2455	myclobutanil + thiabendazole
UBI-2458	carbathiin + metalaxyl + thiabendazole
UBI-2461	metalaxyl
UBI-2464	metalaxyl + thiabendazole
UBI-2465	thiram + triadimenol
UBI-2466	thiram + triadimenol
UBI-2467	carbathiin + thiram
UBI-2468	carbathiin + metalaxyl
UBI-2469	carbathiin + oxadixyl
UBI-2471	carbathiin + imazalil + lindane
UBI-2472	carbathiin + lindane + metalaxyl
UBI-2473	carbathiin + lindane + oxadixyl
UBI-2475	carbathiin + thiabendazole
UBI-2476	metalaxyl + thiabendazole
UBI-2477	carbathiin + metalaxyl + thiabendazole
UBI-2492	carbathiin
UBI-2496	aldoxycarb
UBI-2497	myclobutanil
UBI-2498	unknown
UBI-2498-1	carbathiin + thiabendazole
UBI-2505	confidential fungicide
UBI-2511	unknown
UBI-2513	unknown
UBI-2522	carbathiin + metalaxyl
UBI-A-815	triflumizole
UBI-A920	UBI-1759
UBI-A815	triflumizole
UBI-P368	oxyfenthiin
UC27-BF-32	trimethacarb
UCSF-27	carbaryl
UCSF-40	carbaryl
UCZF-14	mexacarbate
UCZF-15	mexacarbate
UNICO FLY BAIT	muscalure + propoxur
V4X	carbathiin + oxine-copper
validamycin a	SOLACOL
VANGARD	etaconazole
VAPAM	metam-sodium
VAPONA NO-PEST STRIP	dichlorvos
VECTOBAC	*B. thuringiensis israelensis*
VENDEX	fenbutatin oxide

vinclozolin	RONILAN
VINEGAR	acetic acid
VITAFLO 250	carbathiin
VITAFLO 280	carbathiin + thiram; UBI-2051
VITAFLO DB	carbathiin + thiram
VITAFLO DF	carbathiin + thiram
VITAFLO DUAL PURPOSE	carbathiin + lindane + thiram
VITAFLO-MANEB	carbathiin + maneb
VITAFLO-THIRAM	carbathiin + thiram
VITAVAX	carbathiin
VITAVAX 200	carbathiin + thiram; UBI-1196
VITAVAX 2100	carbathiin
VITAVAX 75W	carbathiin
VITAVAX DUAL POWDER	carbathiin + lindane + thiram
VITAVAX P	vitavax powder
VITAVAX POWDER	carbathiin + thiram; VITAVAX P
VITAVAX RS	carbathiin + lindane + thiram; OSECO REGENT; UBI-2369; UBI-2369-1
VITAVAX SOLUTION	carbathiin
VOLID	brodifacoum
VORLEX	1,3-dichloropropene + methyl isothiocyanate
VYDATE	oxamyl
WARBEX	famphur
WETTABLE SULPHUR	sulphur
WL-41706	fenpropathrin
WL-85871	ALPHAMETHRIN; FASTAC
X-77	MULTI-FILM X-77
XE-779	DINICONAZOLE; SPOTLESS; XE-779L
XE-779L	XE-779
XRD-429	DOWCO-429
XRD-473	DOWCO-473
ZECTRAN	mexacarbate
zinc phosphide	MOUSE BAIT
zineb	DITHANE Z-78; PARZATE; PARZATE C; PARZATE-C
ZOLONE	phosalone

Indexes

RESIDUE INDEX

BENOMYL, RESIDUE.....335,336
CARBARYL, RESIDUE.....364
CHLORPYRIFOS, RESIDUE.....359
COPPER OXYCHLORIDE, RESIDUE.....335,336
CYPERMETHRIN, RESIDUE.....345,346,352,357,358,361
DELTAMETHRIN, RESIDUE.....174,345,358
DIAZINON, RESIDUE.....346,352,359
DIMETHOATE, RESIDUE.....354
DINOCAP, RESIDUE.....336
DIOCTYL ADIPATE, RESIDUE.....353
DODEMORPH, RESIDUE.....336
FENVALERATE, RESIDUE.....353,358
FONOFOS, RESIDUE.....356
IPRODIONE, RESIDUE.....362
MALATHION, RESIDUE.....355
OMETHOATE, RESIDUE.....354
OXYDEMETON-METHYL, RESIDUE.....363
PERMETHRIN, RESIDUE.....345,348,349,350,351,358,360
PHORATE, RESIDUE.....356
SULPHUR, RESIDUE.....336
TRIFORINE, RESIDUE.....336

CHEMICAL INDEX

1,3-DICHLOROPROPENE.....341,343,344
A0201.....286
ABG-6149.....145,146
ABG-6162A.....9
ABG-6198A.....23,104
ABG-6228.....8
ACEPHATE.....68,137
ACETIC ACID.....335
ACR-3675.....198,330
ACR-3815.....21,183,187,188,198
AGRAL 90 + CODLING MOTH GRANULOSIS VIRUS + POWDERED SKIM MILK.....7
AGRAL 90 + CODLING MOTH GRANULOSIS VIRUS + GUTHION + POWDERED SKIM MILK..7
AGROSOL.....222
AGROSOL FLOWABLE.....222
AGROSOL POUR-ON.....221,222,223,224
AGROSOL T.....221,222,223,224
AGROX.....217,235,236,239,240,277,285
AGROX B-3.....156,223,224
AGROX D-L PLUS.....76,77
AGROX D-L-M.....76,77,221
AGROX FLOWABLE.....244,249,250,251,264,286,299
AGROX NM.....303
AGSCO DB-RED.....285
AH-87600.....352
ALDICARB.....110,111,112,118,119,120,121,123,342
ALIETTE + BHC + FURADAN + ROVRAL.....204
ALIETTE + ROVRAL.....320,332
ALIETTE EXTRA.....217
ALSYSTIN.....3,4,37,42
AMBUSH.....65,68,127,128,134,168,171,345,358,360
AMBUSH + M-ONE.....134
AMMONIUM PHOSPHATE.....189
AMMONIUM PHOSPHATE + FORMALDEHYDE.....189
AMMONIUM PHOSPHATE + FORMALIN.....189
AMMONIUM SULPHAMATE.....106
AMMONIUM SULPHAMATE + ASSIST + CARBOFURAN + SETHOXYDIM.....106
AMMONIUM SULPHAMATE + ASSIST + DECIS + POAST.....106

AMMONIUM SULPHAMATE + ASSIST +
DELTAMETHRIN + SETHOXYDIM.....106
AMMONIUM SULPHAMATE + ASSIST +
FURADAN + POAST.....106
AMMONIUM SULPHAMATE + ASSIST +
METHAMIDOPHOS + SETHOXYDIM.....106
AMMONIUM SULPHAMATE + ASSIST +
MONITOR + POAST.....106
AMMONIUM SULPHAMATE + ASSIST + POAST....106
AMMONIUM SULPHAMATE + ASSIST +
SETHOXYDIM.....106
ANCHOR.....156,221,222,223,224,225,247,291
ANCHOR + UBI-2505.....156
ANILAZINE.....230
ANVIL.....330,331
APOLLO.....8,9,11,12,14,15,16,17,18,19,20,
22,33
APOLLO + BASUDIN.....9
APOLLO + DIMILIN.....38
APOLLO + PLICTRAN.....11,12
APRON.....215,235,236,240,334
APRON 35.....217
APRON 35 + BENLATE.....217
APRON 70.....217
ARREST.....319,328,329,332,333
ASSIST.....106,262,295
ASSIST + SPOTLESS.....262,295
ASSIST + XE-779.....262,295
ATROBAN.....163
ATROBAN DELICE POUR-ON.....161,348,351
AVADEX.....206,233
AVERMECTIN B1.....167,168
AVID.....167,168
AZINPHOS-METHYL.....3,4,5,6,7,35,36,37,41,42,44,49,
50,55,57,61,100,103,179
AZINPHOS-METHYL + CAPTAN.....49,50
AZINPHOS-METHYL + DORMANT OIL.....41
AZINPHOS-METHYL + GRANULOSIS VIRUS +
NONYLPHENOLETHYLENE OXIDE + POWDERED
SKIM MILK.....7
AZINPHOS-METHYL + SUN OIL.....57
B-3.....156,221,222,223,224
B. THURINGIENSIS BERLINER.....23,104,145,146
B. THURINGIENSIS ISRAELENSIS.....160
B. THURINGIENSIS KURSTAKI.....3,4,34,37,42,48,49,50,51,78,85,
127,128,129,136,138,145,146
B. THURINGIENSIS KURSTAKI + CAPTAN.....48,49,50
B. THURINGIENSIS KURSTAKI + CAPTAN +
CYPERMETHRIN.....3,4,37,42,51

B. THURINGIENSIS KURSTAKI + CAPTAN + FENVALERATE.....48
B. THURINGIENSIS KURSTAKI + CAPTAN + PERMETHRIN.....3,4,37,42
B. THURINGIENSIS SAN DIEGO.....94,97,98,99,100,101,104,107,108, 134,312
B. THURINGIENSIS SAN DIEGO + CARBOFURAN.....312
B. THURINGIENSIS SAN DIEGO + CHLOROTHALONIL.....108
B. THURINGIENSIS SAN DIEGO + FENVALERATE.....97
B. THURINGIENSIS SAN DIEGO + MANCOZEB...108
B. THURINGIENSIS SAN DIEGO + PERMETHRIN.....134
BACTOSPEINE-A.....145,146
BANNER.....331
BAS-222.....237
BAS-9053.....273,274,278
BAS-9053 + CORBEL.....273,274,278
BAS-9053 + FENPROPIMORPH.....273,274,278
BASF-166801.....23,43,45
BASF-LAB-166801.....23,43,45,47,78,104,108,129
BASUDIN.....9,39,41,69,70
BASUDIN + FASTAC.....108,139
BASUDIN + SAVEY.....9
BASUDIN + TRITON B-1956.....69,70
BAY-HWG-1608.....198,203,207,243,245,246,247,248, 252,253,254,258,263,265,266,267, 268,280,281,284,285,287,288,289, 290,292,293,298,300,303,304,309, 310,311,322,324
BAY-HWG-1608 + CHLOROTHALONIL.....311
BAY-HWG-1608 + NUARIMOL.....243,248
BAY-NTN-19701.....239
BAYCOR.....21,183,316,320,332,333
BAYCOR + BRAVO 500.....316
BAYCOR + DEXON.....316,320,332,333
BAYCOR + POLYRAM.....21,183
BAYLETON.....216,252,253,256,258,259,260,261, 263,265,268,280,288,289,290,293, 296,297,298,300,301,302,304,309, 316,327,331,333
BAYLETON + DEXON.....316
BAYLETON + GALBEN.....320
BAYOFLY.....159
BAYTAN.....245,246,247,266,267,284,310,316, 333
BAYTAN + BHC + FURADAN.....204

BAYTAN + DEXON.....316
BAYTAN + GALBEN.....316
BAYTHROID.....117,122,142
BELMARK.....35,57,94,96,97,99,100,114,358
BELMARK + CAPTAN.....48
BELMARK + CAPTAN + DIPEL.....48
BELMARK + M-ONE.....97
BENALAXYL.....204,215,221,222,316,320
BENALAXYL + CAPTAN + CARBOFURAN + LINDANE.....204
BENALAXYL + CAPTAN + MOLYBDENUM.....222
BENALAXYL + CARBOFURAN + LINDANE.....204
BENALAXYL + IMAZALIL.....221
BENALAXYL + THIRAM.....215
BENALAXYL + TRIADIMEFON.....320
BENALAXYL + TRIADIMENOL.....316
BENDIOCARB.....167,168
BENLATE.....190,191,192,195,198,199,200,201,210,211,212,216,217,218,220,225,231,232,298,303,319,320,332,335,336,337,338,340
BENLATE + BHC + FURADAN + RIDOMIL + VITAVAX RS.....204
BENLATE + BRAVO + TILT.....292
BENLATE + CAPTAN.....196
BENLATE + COLD WATER.....339
BENLATE + DITHANE M-45.....232
BENLATE + MANZATE 200.....181,182,185,186,190,192,231
BENLATE + RIDOMIL.....319
BENLATE + RIDOMIL + VITAVAX.....319,320,332
BENLATE + TERSAN SP.....319,320,332
BENLATE + TRITON B-1956.....199,200,201
BENLATE + WARM WATER.....339
BENOMYL.....181,182,185,186,190,191,192,195,196,198,199,200,201,204,210,211,212,216,217,218,220,225,231,232,292,298,303,319,320,332,335,336,337,338,339,340
BENOMYL + CAPTAN.....196
BENOMYL + CARBATHIIN + METALAXYL.....319,320,332
BENOMYL + CARBOFURAN + LINDANE + METALAXYL + VITAVAX RS.....204
BENOMYL + CHLORONEB.....319,320,332
BENOMYL + CHLOROTHALONIL + PROPICONAZOLE.....292
BENOMYL + MANCOZEB.....181,182,185,186,190,192,231,232
BENOMYL + METALAXYL.....217,319
BENOMYL + TRITON B-1956.....199,200,201
BENOMYL + WATER.....339

BHC.....204
BHC + CAPTAN + FURADAN.....204
BHC + CAPTAN + FURADAN + GALBEN.....204
BHC + CAPTAN + FURADAN + RIDOMIL.....204
BHC + DEXON + FURADAN + TERRACHLOR.....204
BHC + FURADAN.....204
BHC + FURADAN + FURADAN F1 SEED TREATER.....204
BHC + FURADAN + GALBEN.....204
BHC + FURADAN + PP-450 + RIDOMIL.....204
BHC + FURADAN + RH-3866 + RIDOMIL.....204
BHC + FURADAN + RIDOMIL.....204
BHC + FURADAN + RIDOMIL + RIZOLEX.....204
BHC + FURADAN + RIDOMIL + UBI-2342.....204
BHC + FURADAN + RIZOLEX.....204
BHC + FURADAN + ROVRAL PLUS.....204
BHC + FURADAN + SAN-518.....204
BHC + FURADAN + THIRAM.....204
BHC + FURADAN + VITAVAX RS.....204
BIFENTHRIN.....2,3,4,18,37,42,44,57,59,73,78,79,100,103,108,116,117,122,129,131,132,133,167,168
BILOXAZOL.....316
BIRLANE.....88,89,90,125
BITERTANOL.....21,183,316,320,332,333
BITERTANOL + CHLOROTHALONIL.....316
BITERTANOL + FENAMINOSULF.....316,320,332,333
BITERTANOL + METIRAM.....21,183
BLADEX.....206,233
BOTRAN.....219
BOTRAN + NUSTAR.....198
BOVAID.....163,353
BRAVO.....226,227,228,229,231,292,311
BRAVO + CORBEL.....311
BRAVO + FOLICUR.....311
BRAVO + HOE-000522.....108
BRAVO + LENTAGRAN.....227
BRAVO + LENTAGRAN + SENCOR 500.....227
BRAVO + M-ONE.....108
BRAVO + RIDOMIL MZ.....238
BRAVO + SENCOR 500.....227
BRAVO + TILT.....292
BRAVO 500.....216,230,232,237,265,298,300,316,320,332
BRAVO 500 + CYCOCEL + TILT.....312
BRAVO 500 + TILT.....312,313
BRAVO 90DG.....230
BRIGADE.....2,3,4,18,37,42,44,57,59,73
BRODIFACOUM.....52

BROOT.....86,147,151,153
C-I-L LAWN FUNGICIDE.....327,328,329
C-I-L LAWN FUNGICIDE + PP-523.....327,328,329
CAN-O-JET.....81
CANO-O-JET.....81
CAPTAFOL.....230
CAPTAN.....3,4,37,42,48,49,50,51,76,77,156,196,204,217,221,222,223,224,225,334,338
CAPTAN + CARBATHIIN.....334
CAPTAN + CARBOFURAN + LINDANE.....204
CAPTAN + CARBOFURAN + LINDANE + METALAXYL.....204
CAPTAN + CYMBUSH.....49,50,51
CAPTAN + CYMBUSH + DIPEL.....3,4,37,42,51
CAPTAN + CYPERMETHRIN.....49,50,51
CAPTAN + DECIS.....49,50
CAPTAN + DELTAMETHRIN.....49,50
CAPTAN + DIAZINON + LINDANE.....76,77,156,221,222,223,224
CAPTAN + DIPEL.....48,49,50
CAPTAN + DIPEL + POUNCE.....3,4,37,42
CAPTAN + DIPEL + RIPCORD.....3,4,42,51
CAPTAN + FENVALERATE.....48
CAPTAN + GUTHION.....49,50
CAPTAN + METALAXYL.....217
CAPTAN + PERMETHRIN.....49,50
CAPTAN + POUNCE.....49,50
CAPTAN + RIPCORD.....49,50
CAPTAN + THIABENDAZOLE.....222
CAPTAN + VITAVAX.....334
CAPTURE.....78,79,100,103,108,116,117,122,129,131,132,133
CARBARYL.....3,4,127,128,140,141,169,170,172,364
CARBARYL + WHEAT BRAN.....140,141
CARBATHIIN.....80,81,86,87,88,89,90,156,203,204,205,207,208,209,213,217,221,222,223,224,225,243,244,245,246,247,248,249,250,251,254,264,266,267,276,277,284,285,286,287,291,299,303,310,317,318,319,320,321,328,329,331,332,333,334
CARBATHIIN + FURMECYCLOX + METALAXYL....203,207
CARBATHIIN + IMAZALIL.....243,248,276,286
CARBATHIIN + IMAZALIL + THIABENDAZOLE...276,291,317
CARBATHIIN + LINDANE + METALAXYL.....203,205,207
CARBATHIIN + LINDANE + THIABENDAZOLE....203,207
CARBATHIIN + LINDANE + THIRAM.....80,81,203,205,207,208,209,213

CARBATHIIN + LINDANE + TOLCLOFOS-METHYL.....209
CARBATHIIN + METALAXYL.....319
CARBATHIIN + METALAXYL + THIABENDAZOLE..203,205,207,217
CARBATHIIN + NUARIMOL.....243,248
CARBATHIIN + OXYCARBOXIN + OXADIXYL.....331
CARBATHIIN + OXYCARBOXIN + THIRAM.....319,328,329,332,333
CARBATHIIN + THIABENDAZOLE.....217,222,223,224,225,247,317
CARBATHIIN + THIOPHANATE-METHYL.....276
CARBATHIIN + THIRAM.....86,87,88,89,90,221,222,223,224,225,244,247,249,250,251,254,264,276,277,286,291,299,303,310,317,318,321
CARBATHIIN + TRIFLUMIZOLE.....276
CARBENDAZIM.....204,212
CARBOFURAN.....81,88,89,90,101,106,110,119,123,124,128,140,144,145,146,147,152,157,179,204,213,312
CARBOFURAN + DI-BETA.....312
CARBOFURAN + FENAMINOSULF + LINDANE + QUINTOZENE.....204
CARBOFURAN + FLUTRIAFOL + LINDANE + METALAXYL.....204
CARBOFURAN + FOSETYL-AL + IPRODIONE + LINDANE.....204
CARBOFURAN + FURADAN SEED TREATER + LINDANE.....204
CARBOFURAN + GAMMASAN PLUS.....204
CARBOFURAN + LINDANE.....204
CARBOFURAN + LINDANE + METALAXYL.....204
CARBOFURAN + LINDANE + METALAXYL + MYCLOBUTANIL.....204
CARBOFURAN + LINDANE + METALAXYL + TOLCLOFOS-METHYL.....204
CARBOFURAN + LINDANE + METALAXYL + TRIFLUMIZOLE.....204
CARBOFURAN + LINDANE + ROVRAL PLUS.....204
CARBOFURAN + LINDANE + SAN-518.....204
CARBOFURAN + LINDANE + THIRAM.....204
CARBOFURAN + LINDANE + TOLCLOFOS-METHYL.....204
CARBOFURAN + LINDANE + TRIADIMENOL.....204
CARBOFURAN + LINDANE + VITAVAX RS.....204
CARBOFURAN + M-ONE.....312
CARBOFURAN + ROVRAL ST.....213
CARBOFURAN + STICKER.....81
CARBOFURAN + THURINGIENSIN.....312
CARBOFURAN + VITAVAX RS.....81,213
CARPOVIRUSINE.....5

CARZOL.....17,22,25,26,35,45,57,167,168
CERONE.....257,258,298,304
CGA-449.....203,205,207,235,236,239,240,241,254,291
CGA-449 + METALAXYL.....203,207
CGA-449 + RIDOMIL.....207
CGA-453.....287
CGF-4280.....203,207
CGF-4320.....205
CHINOMETHIONAT.....8,17,18,23
CHIPMAN B-3.....221,222
CHLORFENVINPHOS.....88,89,90,125
CHLORMEQUAT.....312,313
CHLORMEQUAT + CHLOROTHALONIL + PROPICONAZOLE.....312
CHLORMEQUAT + MANCOZEB.....313
CHLORMEQUAT + MANCOZEB + PROPICONAZOLE..312
CHLORMEQUAT + PROPICONAZOLE.....312,313
CHLORMEQUAT + PROPICONAZOLE + THIOPHANATE-METHYL.....312
CHLORONEB.....319,320,332
CHLOROPHACINONE.....52
CHLOROTHALONIL.....108,216,226,227,228,229,230,231,232,237,238,265,292,298,300,311,312,313,316,320,327,328,329,330,332
CHLOROTHALONIL + FENPROPIMORPH.....311
CHLOROTHALONIL + HEXACONAZOLE.....327,328,329
CHLOROTHALONIL + METRIBUZIN.....227
CHLOROTHALONIL + METRIBUZIN + PYRIDATE..227
CHLOROTHALONIL + PROPICONAZOLE.....292,312,313
CHLOROTHALONIL + PYRIDATE.....227
CHLOROTHALONIL + RIDOMIL MZ.....238
CHLOROTHALONIL + TEFLUBENZURON.....108
CHLORPYRIFOS.....34,36,39,40,86,87,88,89,90,103,117,119,122,123,126,129,141,144,146,147,152,153,155,167,168,175,359
CHLORPYRIFOS + SUPERIOR OIL.....40
CHLORPYRIFOS + WHEAT BRAN.....141
CHLORSULFURON.....233
CITOWETT PLUS.....255,282,283
CITOWETT PLUS + METIRAM.....255,282,283
CITOWETT PLUS + POLYRAM.....255,282,283
CLOETHOCARB.....80,81,86,87,110,119,123,147,151,153
CLOETHOCARB + VITAVAX RS.....81
CLOFENTEZINE.....8,9,11,12,14,15,16,17,18,19,20,22,33,38

CLOFENTEZINE + CYHEXATIN.....11,12
CLOFENTEZINE + DIAZINON.....9
CLOFENTEZINE + DIFLUBENZURON.....38
CODLING MOTH GRANULOSIS VIRUS.....7
COPPER OXYCHLORIDE.....231,335,336,337
CORBEL.....273,274,278,311
COUNTER.....81,88,110,119,123,126,147,148,
149,150,151,152,153,155,213
COUNTER + ROVRAL ST.....213
COUNTER + VITAVAX RS.....81,213
CYANAZINE.....206,233
CYCOCEL + DITHANE M-45.....313
CYCOCEL + DITHANE M-45 + TILT.....312
CYCOCEL + EASOUT + TILT.....312
CYCOCEL + TILT.....312,313
CYFLUTHRIN.....117,122,142,159
CYGON.....3,4,36,37,42,60,66,67,71,144,
170,354
CYHALOTHRIN.....1,2,3,4,8,9,37,42,44,55,63,64,
66,68,73,75,82,83,91,92,93,105,
109,113,114,115,116,117,122,129,
136,143,158
CYHALOTHRIN + DIMETHOATE.....105,109,113,115
CYHEXATIN.....11,12,13,18,22,27,28,29,30,31,
32,33
CYHEXATIN + HEXYTHIAZOX.....11,12
CYMBUSH.....1,34,37,42,53,55,63,64,72,105,
109,114,115,128,136,345,357,358,
361
CYPERMETHRIN.....1,3,4,34,37,42,49,50,51,53,55,
63,64,72,105,109,114,115,128,
129,131,132,133,136,162,165,166,
179,345,346,352,357,358,361
CYPERMETHRIN + DIAZINON.....162,165,166,346,352
CYPREX.....338
CYROMAZINE.....86,87,126
CYTHION.....2
DACONIL 2787.....330
DANITOL.....44
DASANIT.....88,89,90,124,125,126,147,152,
342
DECIS.....3,4,37,42,47,65,66,67,68,69,70,
71,73,75,78,82,83,84,89,90,95,
102,104,106,116,117,122,130,135,
138,139,140,142,143,144,157,158,
167,168,169,172,173,174,175,176,
345,358
DECIS + HOE-000522.....78
DECIS + TRITON B-1956.....69,70

DELTA-EXOTOXIN OF B.T.....96
DELTAMETHRIN.....3,4,37,42,47,49,50,65,66,67,68,
69,70,71,73,75,78,82,83,84,89,
90,95,102,104,106,116,117,122,
130,135,138,139,140,142,143,144,
157,158,167,168,169,172,173,174,
175,176,179,345,358
DELTAMETHRIN + TEFLUBENZURON.....78
DELTAMETHRIN + TRITON B-1956.....69,70
DEXON.....316
DEXON + RIZOLEX.....316
DEXON + RONILAN.....316
DEXON + ROVRAL.....316
DEXON + TERRACHLOR.....316,320,332
DI-BETA.....101
DI-SYSTON.....110,119,123,147,151,152
DIALLATE.....206,233
DIAZINON.....9,35,36,39,41,65,67,69,70,71,
76,77,88,89,90,108,139,156,162,
165,166,172,221,222,223,224,346,
352,359
DIAZINON + HEXYTHIAZOX.....9
DIAZINON + LINDANE + METALAXYL.....76,77,221
DIAZINON + POTASSIUM OLEATE.....65
DIAZINON + TRITON B-1956.....69,70
DIAZINON + WL-85871.....108,139
DICHLORAN.....198,219
DICHLORAN + FLUSILAZOLE.....198
DICOFOL.....17,94
DIFLUBENZURON.....3,4,6,37,38,42,45,46,47,58,59
DIFOLATAN.....230
DIMETHOATE.....3,4,36,37,42,60,62,66,67,69,70,
71,105,109,113,115,144,170,354
DIMETHOATE + TRITON B-1956.....69,70
DIMILIN.....3,4,6,37,42,45,46,47,58,59
DINOCAP.....336,337
DIPEL.....34,85,129,138,145,146
DIPHACINONE.....52
DISULFOTON.....110,119,123,147,151,152
DITHANE F-45.....230
DITHANE M-45.....21,226,227,228,229,230,231,235,
236,237,240,253,255,259,260,261,
262,265,268,269,270,275,280,282,
283,292,295,298,300,301,302,304,
306,308,311,312,313,314,315,325
DITHANE M-45 + HOE-000522.....108
DITHANE M-45 + LENTAGRAN.....227
DITHANE M-45 + LENTAGRAN + SENCOR 500...227
DITHANE M-45 + M-ONE.....108

DITHANE M-45 + PP-523.....21,183
DITHANE M-45 + RH-3866.....21,183,298
DITHANE M-45 + SENCOR 500.....227
DITHANE M-45 + SPOTLESS.....262,295
DITHANE M-45 + TILT.....226,230,271,272,292,294,301,305,
312,313,323
DITHANE M-45 + TRITON XR.....226
DODEMORPH.....336,337
DODINE.....187,194,338
DORMANT OIL.....41
DORMANT OIL + GUTHION.....41
DOWCO-429X.....177,178
DOWICIDE A.....195
DOWICIDE A + HOT WATER.....195
DPX-965.....212
DPX-H6573.....181,182,185,186,190,191,192,319,
320,330,333
DPX-H6573 + MANZATE 200.....21,183
DPX-H6573 + RIDOMIL.....319
DPX-Y5893.....8,9,10,25,26,27,28,29,30,31,32,
56
DYFONATE.....86,88,89,90,117,118,119,120,121,
122,123,129,141,146,147,148,149,
150,151,152,153,155,356
DYFONATE + THIRAM.....86,87
DYFONATE + WHEAT BRAN.....141
DYRENE.....230
EASOUT.....194,199,200,201,212,216,218,235,
236,239,240,241,253
EASOUT + MANZATE 200.....194
EASOUT + RIDOMIL.....320,332
EASOUT + RIZOLEX.....333
EASOUT + TILT.....253,312
EASOUT + TRITON B-1956.....199,200,201
EG-2158.....96
EL-222.....319
EL-222 + RIDOMIL.....319
EL-228.....243,248,303
EL-228 + HWG-1608.....243,248
EL-228 + PP-450.....243,248
EL-228 + UBI-2100-2.....243,248
EL-228 + UBI-2466.....243,248
EL-228/FN-5116.....286
EL-5261.....206
EMULSIFIABLE SPRAY OIL.....24
ENDOSULFAN.....66,68,135,167,168
ENHANCE.....212,218,265
ENHANCE + PROCHLORAZ.....212,218,265
ENHANCE + SPORTAK.....212,218,265

EPIC + RIDOMIL + VITAVAX.....203,207
EQUAL.....187,194
ET-611.....165
ET-696.....165
ETHALFLURALIN.....206
ETHALFLURALIN + TRIFLURALIN.....206
ETHEPHON.....257,258,298,304
ETHION.....33,34
ETHION + OKANAGAN DORMANT OIL.....34
ETHION + OKANAGAN OIL.....34
ETHION + SUPERIOR OIL.....33
ETRIDIAZOLE.....334
FASTAC.....108,139,142
FENAMINOSULF.....204,316,320,332,333,334
FENAMINOSULF + IPRODIONE.....316
FENAMINOSULF + QUINTOZENE.....316,320,332
FENAMINOSULF + TOLCLOFOS-METHYL.....316
FENAMINOSULF + TRIADIMEFON.....316
FENAMINOSULF + TRIADIMENOL.....316
FENAMINOSULF + VINCLOZOLIN.....316
FENAMIPHOS.....342
FENARIMOL.....319
FENARIMOL + METALAXYL.....319
FENITROTHION.....36,43,44
FENPROPATHRIN.....44
FENPROPIMORPH.....230,273,274,278,298,302,311
FENSULFOTHION.....88,89,90,124,125,126,147,152,342
FENVALERATE.....35,48,57,94,96,97,99,100,114,163,164,179,353,358
FERBAM.....338
FLUSILAZOLE.....21,181,182,183,185,186,188,190,191,192,193,198,319,320,330,333
FLUSILAZOLE + MANCOZEB.....21,183,188
FLUSILAZOLE + METALAXYL.....319
FLUTRIAFOL.....203,204,207,212,243,244,247,248,249,250,251,254,264,277,279,286,287,291,299,317,318,321,322
FLUTRIAFOL + LINDANE.....244,277
FLUTRIAFOL + NUARIMOL.....243,248
FMC-54800.....108
FOLICUR.....258,263,268,281,288,289,290,292,293,298,304,309,311
FONOFOS.....86,87,88,89,90,117,118,119,120,121,122,123,129,141,146,147,148,149,150,151,152,153,155,356
FONOFOS + THIRAM.....86,87
FONOFOS + WHEAT BRAN.....141
FORMALDEHYDE.....189

FORMALIN.....189
FORMETANATE.....17,22,25,26,35,45,57,167,168
FORTRESS.....126
FOSETYL-AL.....204,217,320,332
FOSETYL-AL + CAPTAN + THIABENDAZOLE.....217
FOSETYL-AL + IPRODIONE.....320,332
FUNGINEX.....199,200,201,336,337
FUNGINEX + TRITON B-1956.....199,200,201
FURADAN.....81,88,89,90,106,110,119,123,124,
128,140,144,145,146,147,152,157,
204
FURADAN + GAMMASAN PLUS.....204
FURADAN + STICKER.....81
FURADAN + VITAVAX RS.....81
FURADAN CR-10.....213
FURADAN CR-10 + ROVRAL ST.....213
FURADAN CR-10 + VITAVAX RS.....213
FURADAN SEED TREATER.....204
FURMECYCLOX.....203,207
GAMMASAN PLUS.....204
GLEAN.....233
GRANULOSIS VIRUS.....5,7
GRANULOSIS VIRUS + NONYLPHENOLETHYLENE
OXIDE + POWDERED SKIM MILK.....7
GUS-4700.....276
GUS-4700 + VITAFLO 250.....276
GUS-80502.....204
GUTHION.....3,4,5,6,35,36,37,41,42,44,57,
61,100,103
GUTHION + SUN OIL.....57
HEXACONAZOLE.....21,183,188,198,212,218,327,328,
329,330,331
HEXACONAZOLE + MANCOZEB.....21,183,188
HEXYTHIAZOX.....8,9,10,11,12,18,19,22,25,26,27,
28,29,30,31,32,33,56
HOE-000388.....146
HOE-000522.....3,4,6,37,42,43,45,46,47,58,59,
73,75,78,79,100,104,107,108,130,
138,145,146
HOT WATER.....195
HWG-1608.....203,207,243,245,246,247,248,252,
253,254,265,266,267,280,284,287,
292,300,310,322
IMAZALIL.....221,243,244,248,249,250,251,254,
264,276,277,279,286,291,299,317,
318,321,322
IMAZALIL + MANCOZEB.....317
IMAZALIL + THIABENDAZOLE + TRIADIMENOL..276
IMAZALIL + TRIADIMENOL.....244,249,250,251,254,264,276,277,
279,286,299,317,318,321,322

IMIDAN.....63,64
INSEGAR.....58,59
IPRODIONE.....196,197,199,203,204,205,207,212,213,217,218,220,230,239,316,320,330,331,332,334,362
IPRODIONE + LINDANE.....205,207,213,217
IPRODIONE + TRITON B-1956.....199
IVORY LIQUID.....335
JAVELIN.....78
KARATE.....1,2,3,4,8,9,37,42,44,55,63,64,66,68,73,75,82,83,91,92,93,105,109,113,114,115,116,117,122,129,136,143,158
KARATE + SYS-TEM.....105,109,113,115
KARATHANE.....336,337
KELTHANE.....17,94
LAB-166801.....47,78,104,129
LANCE.....80,81,86,87,110,119,123,147,151,153
LANCE + VITAVAX RS.....81
LANNATE.....35,36,128
LARVIN.....129
LATERS LEAF SHINE.....335
LC-477.....252
LC-477 + PROCHLORAZ.....252
LC-477 + SPORTAK.....252
LENTAGRAN.....227
LESAN.....334
LINDANE.....76,77,80,81,156,203,204,205,207,208,209,213,217,221,222,223,224,244,277,285
LINDANE + MANEB.....285
LINDANE + RIZOLEX.....208,209
LINDANE + RIZOLEX + VITAVAX.....209
LINDANE + THIABENDAZOLE + THIRAM.....81,203,205,207
LINDANE + TOLCLOFOS-METHYL.....208,209
LORSBAN.....34,36,39,40,86,87,88,89,90,103,117,119,122,123,126,129,141,144,146,147,152,153,155,167,168,175,359
LORSBAN + SUPERIOR OIL.....40
LORSBAN + WHEAT BRAN.....141
M-ONE.....94,97,98,99,100,101,104,107,108,134
MALATHION.....2,3,4,73,169,170,172,355
MANCOZEB.....21,108,181,182,183,184,185,186,187,188,190,192,194,198,204,226,227,228,229,230,231,232,235,236,237,238,240,241,253,255,259,260,

MANCOZEB.....261,262,265,268,269,270,271,272,
275,280,282,283,292,294,295,298,
300,301,302,304,305,306,308,311,
312,313,314,315,317,321,323,325
MANCOZEB + METALAXYL.....237,238
MANCOZEB + METRIBUZIN.....227
MANCOZEB + METRIBUZIN + PYRIDATE.....227
MANCOZEB + MYCLOBUTANIL.....21,183,188,298
MANCOZEB + PENCONAZOLE.....21,183,184,187,188,198
MANCOZEB + PROPICONAZOLE.....226,230,271,272,292,294,301,305,
312,313,323
MANCOZEB + PYRIDATE.....227
MANCOZEB + RIDOMIL MZ.....238
MANCOZEB + RO-15-1297.....21,183,187,188,198
MANCOZEB + TEFLUBENZURON.....108
MANCOZEB + THIOPHANATE-METHYL.....194
MANCOZEB + TILT.....301
MANCOZEB + TRIADIMENOL.....317,321
MANCOZEB + TRITON XR.....226
MANCOZEB + XE-779.....262,295
MANEB.....217,226,235,236,239,240,244,249,
250,251,264,275,277,282,283,285,
286,299,303
MANEB + THIABENDAZOLE.....303
MANZATE.....226,282,283
MANZATE 200.....21,183,185,186,188,190,192,226,
230,231,237,238
MANZATE 200 + NUSTAR.....21,183,188
MANZATE 200 + PP-523.....188
MANZATE 200 + RH-3866.....188
MANZATE 200 + RIDOMIL MZ.....238
MELTATOX.....336,337
MEPRONIL.....247
MERCURIC CHLORIDE.....316,319,320,332,333
MERTECT.....195,217,235,236,239,240,241,298,
303
METALAXYL.....76,77,203,204,205,207,215,217,
221,222,235,236,237,238,240,319,
320,332,334
METALAXYL + NNF-136.....319
METALAXYL + THIABENDAZOLE.....217
METALAXYL + THIOPHANATE-METHYL.....320,332
METALAXYL + TRIFLUMIZOLE.....319
METASYSTOX-R.....2,363
METHAMIDOPHOS.....106,117,122
METHIDATHION.....36,39
METHOMYL.....35,36,128
METHOXYCHLOR.....65,68,71
METHOXYCHLOR + POTASSIUM OLEATE.....65

METIRAM.....21,183,184,203,207,230,237,238,255,265,275,280,282,283,300,314,315
METRIBUZIN.....206,227,233
MICOGEN.....104
MICRO-NIASUL.....336,337
MICROCOP-50.....335,336,337
MINERAL OIL-INSECTICIDE.....23
MINTOX.....65
MISTRAL.....230,298,302
MOLYBDENUM.....222
MONCEREN.....239
MONCUT.....207,319,330,331
MONCUT + RIDOMIL.....319
MONITOR.....106,117,122
MORESTAN.....8,17,18,23
MYCLOBUTANIL.....21,183,188,204,243,247,248,264,285,286,287,291,298,299,303,317,322,325
MYCLOBUTANIL + THIABENDAZOLE.....291
NC-28410.....321
NEMACUR.....342
NIAGARA FIXED COPPER.....231
NNF-136.....203,207,239,319,330,331
NO-DAMP.....334
NONYLPHENOLETHYLENE OXIDE.....7
NUARIMOL.....243,248,286,303
NUARIMOL + UBI-2466.....243,248
NUSTAR.....181,182,185,186,188,190,191,192,193,198,330
OIL CONCENTRATE.....23
OKANAGAN DORMANT OIL.....24
OKANAGAN OIL.....24,34
OMITE.....14
ORTHENE.....68,137
OXADIXYL.....204,331
OXALIC ACID.....335
OXAMYL.....179
OXINE BENZOATE.....334
OXYCARBOXIN.....319,328,329,331,332,333
OXYDEMETON-METHYL.....2,363
PARATHION.....89,90,118,120,121,123
PCNB.....223,224,239
PENCONAZOLE.....21,183,184,187,188,198
PERMETHRIN.....3,4,35,37,42,49,50,65,68,79,100,117,122,127,128,134,138,146,161,163,164,168,171,345,348,349,350,351,358,360
PHEROCON AM.....60,61,62

PHORATE.....110,111,112,118,119,120,121,123,
147,151,152,153,356
PHOSALONE.....100,103,104,116
PHOSMET.....63,64
PIRIMICARB.....1,2,91,92,113
PIRIMOR.....1,2,91,92,113
PLICTRAN.....11,12,13,18,22,27,28,29,30,31,
32,33
PLICTRAN + SAVEY.....11,12
POLYRAM.....184,203,207,230,237,238,255,265,
275,280,282,283,300,314,315
POTASSIUM CHLORIDE.....320,332
POTASSIUM OLEATE.....65,335
POTASSIUM OLEATE + PYRETHRINS.....65
POUNCE.....3,4,35,37,42,79,100,117,122,138,
146
POWDERED SKIM MILK.....7
PP-321.....1,63,64,66,114,143,158
PP-450.....212,243,248,254,287
PP-523.....198,212,218,327,328,329,330,331
PP-993.....76,77,147,148,149,150,151,153,
156
PRO GRO.....86,87,88,89,90
PRO GRO SYSTEMIC SEED PROTECTANT.....86,87,88,89,90
PROCHLORAZ.....212,218,252,265,300,303,317,318,
320,321,322,333
PROPARGITE.....14
PROPICONAZOLE.....216,226,230,231,252,253,256,257,
258,259,260,261,263,265,268,269,
270,271,272,273,274,278,280,281,
288,289,290,292,293,294,296,297,
298,300,301,302,304,305,306,307,
308,309,312,313,314,315,323,324,
325,331
PROPICONAZOLE + THIOPHANATE-METHYL.....253,312
PYRETHRINS.....65
PYRETHROIDS.....173
PYRIDATE.....227
QUINTOZENE.....204,223,224,239,316,320,331,332,
334
RAMIK BRUN.....52
RH-3866.....188,243,248,286,291,303,317,325
RH-5782.....285
RH-7592.....247,253,254,286,287,325
RHC-376.....235,236,240
RHC-377.....235,236,240
RIDOMIL.....207,215,319
RIDOMIL + UBI-2342.....319
RIDOMIL + VITAVAX.....319

RIDOMIL MZ.....237,238
RIPCORD.....42,129,131,132,133
RIZOLEX.....239,316
RIZOLEX + UBI-2369-1.....208
RIZOLEX + UBI-2410.....208
RIZOLEX + VITAVAX RS.....209
RO-13-5223.....6,58,59
RO-15-1297.....21,183,187,188,198
RONILAN.....212,230,316,338
ROVRAL.....196,197,199,203,212,218,230,239,
316,320,330,332,334,362
ROVRAL + TRITON B-1956.....199
ROVRAL FLO.....220
ROVRAL GREEN.....330,331
ROVRAL PLUS.....204
ROVRAL ST.....205,207,213,217
ROVRAL ST + TERBUFOS.....213
ROZOL.....52
SAFERS ID.....65
SAFERS INSECTICIDAL SOAP.....65,335
SAN-415.....127,128,129,145,146
SAN-485.....146
SAN-518.....204
SANBAR.....349,350
SAP-404.....65
SAVEY.....8,9,10,11,12,18,19,22,25,26,27,
28,29,30,31,32,33,56
SCOTTS LAWN DISEASE PREVENTER.....331
SD-208304.....126,177,178
SDS-45037.....247
SENCOR.....206,233
SENCOR 500.....227
SETHOXYDIM.....106
SEVIN.....3,4,169,170,172
SEVIN XLR.....127,128,140,141,364
SEVIN XLR + WHEAT BRAN.....140,141
SN-84364.....317,318,321
SODIUM 2-PHENYLPHENOXIDE.....195
SODIUM 2-PHENYLPHENOXIDE + WATER.....195
SOLACOL.....239
SPORTAK.....212,218,252,265,300,303,320,333
SPOTLESS.....203,207,247,253,254,262,295
SPOTLESS + THIRAM.....247
STICKER.....81
STOCKAID.....165
SULPHUR.....194,336,337
SUMITHION.....36,43,44
SUN OIL.....57
SUNSPRAY.....24

SUPERIOR OIL.....23,33,40
SUPRACIDE.....36,39
SYS-TEM.....62,109,113
TALSTAR.....167,168
TBZ.....212
TEFLUBENZURON.....3,4,6,37,42,43,45,46,47,58,59,
73,75,78,79,100,104,107,108,130,
138,145,146
TEFLUTHRIN.....76,77,147,148,149,150,151,153,
156,177,178
TELONE II-B.....341,343,344
TEMIK.....110,111,112,118,119,120,121,123,
342
TERBUFOS.....81,88,110,119,123,126,147,148,
149,150,151,152,153,155,213
TERBUFOS + VITAVAX RS.....81,213
TERRACHLOR.....316,320,332
TERSAN SP.....319,320,332
TF-3479B.....303
TF-3480.....244,249,250,251,277,279
TF-3560.....303
TF-3607.....81,203,205,207
TF-3621.....222
TF-3645.....303
TF-3651.....221
TF-3656.....244,249,250,251,254,264,277,279,
286,299,317,318,321,322
TF-3673.....244,247,249,250,251,254,277,279
TF-3674.....317,318,321,322
TF-3690.....317,318,321,322
TF-3691.....317,321
TF-3694.....317
TF-3723.....221
TF-3738.....322
TF-3739.....322
TF-3752.....203,207,244,247,249,250,251,254,
264,277,279,286,291,299
TF-3753.....244,249,250,251,277,279,291
TF-3754.....76,77
TF-3755.....76,77
TF-3759.....244,277
TF-3760.....244,277
THIABENDAZOLE.....81,195,203,205,207,212,217,221,
222,223,224,225,235,236,239,240,
241,247,276,291,298,303,317
THIABENDAZOLE + TRIADIMENOL.....276,291
THIABENDAZOLE + UBI-2522.....222
THIMET.....110,111,112,118,119,120,121,123,
147,151,152,153,356

THIODAN.....66,68,135,167,168
THIODICARB.....129,204
THIOPHANATE-METHYL.....194,199,200,201,212,216,218,235,
236,239,240,241,253,276,312,320,
332,333
THIOPHANATE-METHYL + TOLCLOFOS-METHYL...333
THIOPHANATE-METHYL + TRITON B-1956.....199,200,201
THIRAM.....80,81,86,87,88,89,90,156,203,
204,205,207,208,209,213,215,221,
222,223,224,225,243,244,247,248,
249,250,251,254,264,276,277,285,
286,287,291,299,303,310,317,318,
319,321,328,329,332,333,338
THIRAM + THIABENDAZOLE.....221,222,223,224
THIRAM + TRIADIMENOL.....243,248,285,287
THIRAM + XE-779.....247
THURICIDE-HPC.....127,128,136
THURINGIENSIN.....8,9,101,312
TILT.....216,226,231,252,253,256,257,258,
259,260,261,263,265,268,269,270,
271,272,273,274,278,280,281,288,
289,290,292,293,294,296,297,298,
300,301,302,304,305,306,307,308,
309,312,313,314,315,323,324,325
TILT-MANCOZEB FORMULATED MIXTURE.....271,272,305
TOLCLOFOS-METHYL.....204,208,209,239,316,333
TOLCLOFOS-METHYL + UBI-2410.....208
TOLCLOFOS-METHYL + VITAVAX RS.....208,209
TOPAS.....198
TOPAS MZ.....21,183,184,187,188,198
TREFLAN.....206,233
TRIADIMEFON.....216,252,253,256,258,259,260,261,
263,265,268,280,288,289,290,293,
296,297,298,300,301,302,304,309,
316,320,327,331,333
TRIADIMENOL.....204,243,244,245,246,247,248,249,
250,251,254,264,266,267,276,277,
279,284,285,286,287,291,299,303,
310,316,317,318,321,322,333
TRIADIMENOL + VITAFLO 280.....276,317,318,321
TRIADIMENOL + VITAVAX 200.....276
TRIFLUMIZOLE.....204,276,319,320,332
TRIFLUMURON.....3,4,37,42
TRIFLURALIN.....206,233
TRIFORINE.....199,200,201,336,337
TRIFORINE + TRITON B-1956.....199,200,201
TRIGARD.....86,87,126
TRIMETHACARB.....86,147,151,153,177,178
TRI-PAK.....106

TRITON B-1956.....65,66,67,69,70,71,199,200,201
TRITON XR.....226
TRUBAN.....334
TRUMPET.....167,168
TUBERSEAL.....241
UBI-1196.....276
UBI-1196 + UBI-2383.....276
UBI-1373.....225
UBI-2051.....317,318,321
UBI-2051 + UBI-2383.....321
UBI-2051 + UBI-2383-1.....317
UBI-2100-2.....243,248,264,286,299
UBI-2155.....264,286,299
UBI-2342.....319,320,332
UBI-2369-1.....203,205,207,208
UBI-2382.....331
UBI-2383.....276,318,321,322
UBI-2383 + UBI-2395.....276
UBI-2383 + UBI-2395 + UBI-2420.....276
UBI-2383 + UBI-2420.....276,318,321
UBI-2383 + VITAFLO 280.....276,318
UBI-2383-1.....291,317
UBI-2383-1 + UBI-2395-1.....291
UBI-2383-1 + UBI-2420.....317
UBI-2391.....276
UBI-2392.....276
UBI-2393.....217,222,223,224,225,247,317
UBI-2393-1.....222
UBI-2393-2.....223,224,247
UBI-2394.....276,291,317
UBI-2394-2.....291,317
UBI-2395.....276
UBI-2395-1.....222
UBI-2395-1 + UBI-2522.....222
UBI-2401.....276
UBI-2402.....203,207
UBI-2402-1.....203,207
UBI-2410.....208
UBI-2417.....203,205,207
UBI-2417-1.....203,205,207
UBI-2420.....276,317,318
UBI-2446.....243,248,286
UBI-2451.....203,205,207
UBI-2454.....243,247,248,264,285,286,287,291,
299
UBI-2455.....291
UBI-2458.....217
UBI-2464.....217
UBI-2466.....243,248,285,287

UBI-2467.....222,223,224,225,247
UBI-2475.....217
UBI-2476.....217
UBI-2477.....217
UBI-2497.....317,322
UBI-2498.....223,224
UBI-2498-1.....222
UBI-2505.....156
UBI-2511.....81
UBI-2513.....81
UBI-2522.....222
VALIDAMYCIN A.....239
VECTOBAC.....160
VINCLOZOLIN.....212,230,316,338
VINEGAR.....335
VITAFLO 250.....225,276
VITAFLO 280.....221,222,223,224,225,244,247,249,
250,251,254,276,277,291,303,310,
317,318,321
VITAVAX.....217,285,319,320,332
VITAVAX 200.....276
VITAVAX P.....225
VITAVAX POWDER.....225
VITAVAX RS.....80,81,203,204,205,207,208,209,
213
VITAVAX SOLUTION.....245,246,266,267,284,287
VOLID.....52
WATER.....195,339
WHEAT.....140,141
WL-85871.....108,139,142
XE-779.....203,207,247,253,254,262,285,295,
331
ZOLONE.....100,103,104,116

NON-TARGET INDEX

APPLE GRAIN APHID.....5
ARTHROPODS.....5
BACTERIA.....177
CAMPYLOMMA SP.....5
ERIOSOMA LANIGERUM.....5
FRUITWORMS.....5
FUNGI.....177
LACEWINGS.....5
LADY BEETLES.....5
LADYBIRD BEETLES.....5
LEAFHOPPERS.....5
LEAFROLLERS.....5
MIDGES.....5
MIRIDS.....5
PLANT BUGS.....5
RHOPALOSHIPUM FITCHII.....5
SOIL MICROBE.....177,178
SPIDERS.....5
SYRPHIDS.....5
THRIPS.....5
WOOLLY APPLE APHID.....5

BIOCONTROL ORGANISM INDEX

ANTHOCORIS SP.....58,59
CAMPYLOMMA VERBASCI.....58,59
CHALCIDS.....43,44,45
CHRYSOPA SP.....58,59
DERAEOCORIS BREVIS.....58,59
EUROPEAN RED MITE.....43,44
HETERORHABDITES HELIOTHIDES.....54
MULLEIN PLANT BUG.....58,59
PANONYCHUS ULMI.....43,44
PHOLETESOR ORNIGIS.....43,44,45
PHYTOSEIID MITES.....43,44,45
STIGMAEID MITES.....43,44,45
TETRANYCHUS URTICAE.....44
TWOSPOTTED SPIDER MITE.....44
TYPHLODROMUS OCCIDENTALIS.....8,9
WESTERN PREDATORY MITE.....8,9
ZETZELLIA MALI.....44,45

PEST INDEX

ACULUS SCHLECHTENDALI.....4,8,9,14,15,16,17,18,19,20,21,
29,30,38,51
ACYRTHOSIPHON PISUM.....91,92,93
AEROPEDELLUS CLAVATUS.....140,141
AGENEOTETIX DEORUM.....140,141
AGROTIS ORTHOGONIA.....175,176
ALTERNARIA ALTERNATA.....302
ALTERNARIA LEAF SPOT.....195,197,224
ALTERNARIA SOLANI.....227,228,229,230,231,232
ALTERNARIA SP.....195,197,224
ANTHONOMUS SIGNATUS.....73
ANTHRACNOSE.....227,228,229,230,231
APHIDS.....137
APHIS POMI.....1,2
APPLE APHID.....1,2
APPLE BROWN BUG.....3,4,38,49,51
APPLE REPLANT DISEASE.....189
APPLE RUST MITE.....4,8,9,14,15,16,17,18,19,20,21,
29,30,38,51
ARCHIPS ARGYROSPILUS.....34
ARTOGEIA RAPAE.....78,79,84,85
ASCOCHYTA BLIGHT.....217
ASCOCHYTA FABAE LENTIS.....217
ASPARAGUS BEETLE.....75
ATRACTOTOMUS MALI.....3,4,38,49,51
AULOCARA ELLIOTTI.....140,141
BARLEY YELLOW STREAK MOSAIC.....144
BERTHA ARMYWORM.....82,83
BIGHEADED GRASSHOPPER.....140,141
BIPOLARIS SOROKINIANA.....303
BLACK FLIES.....160,349,350
BLACK LEG.....203
BLANC.....298,304
BLUEBERRY MAGGOT.....60,61,62
BOVICOLA BOVIS.....159
BROWN APPLE BUG.....3,4,38,49,51
BROWN ROT.....196,197,198,199,200,201
BROWN WHEAT MITE.....144
CABBAGE MAGGOT.....124,125,126
CALIROA CERASI.....69,70
CAMNULA PELLUCIDA.....140,141,142,143,157,158
CAMPAGNOL DES CHAMPS.....52
CAMPYLOMMA VERBASCI.....3,4,35,36,38,49,51
CATTLE BITING LOUSE.....159
CAVITY SPOT.....215

CHAETOSIPHON FRAGEFOLII.....363
CHORISTONEURA ROSACEANA.....49
CHRYSOTEUCHIA TOPIARIA.....359
CLADOSPORIUM SP.....195
CLEARWINGED GRASSHOPPER.....140,141,142,143,157,158
COCHLIOBOLUS SATIVUS.....243,258,263,286
CODLING MOTH.....5,6,7,38,47
COLLETOTRICHUM COCCODES.....227,228,229,230,231
COLORADO POTATO BEETLE.....94,95,96,97,98,99,100,101,102,
103,104,105,106,107,108,109,113,
134,135,136,179
COMMON BUNT.....266,267,284,285
COMMON ROOT ROT.....243,286
COPRINUS PSYCHROMORBIDUS.....316,319,320,332,333
COVERED SMUT.....244
CRANBERRY GIRDLER.....359
CRIOCERIS ASPARAGI.....75
CRUCIFER FLEA BEETLE.....80,81
CYDIA POMONELLA.....5,6,7,38,47
DAMPING-OFF.....205,206,207,208,221
DARKSIDED CUTWORM.....131,132,133,137
DECAY.....197
DELIA ANTIQUA.....86,87,88,89,90
DELIA PLATURA.....77,156
DELIA RADICUM.....124,125,126
DIABROTICA LONGICORNIS BARBERI.....147,148,149,150,151,152,153
DIABROTICA VIRGIFERA VIRGIFERA.....147,149,150,151,152,153,155
DIAMONDBACK MOTH.....79,82,83,85
DIAPORTHE PHASEOLORUM CAULIVORA.....224,225
DIAPORTHE PHASEOLORUM SOJAE.....224,225
DOLLAR SPOT.....327
DORYPHORE DE LA POMME DE TERRE.....95,96,97,98,99,100
DYSAPHIS PLANTAGINEA.....38
EARLY BLIGHT.....227,228,229,230,231,232
EASTERN FIELD WIREWORM.....76
EMPOASCA FABAE.....103,105,115
ENDOPIZA VITEANA.....63,64
EPITRIX CUCUMERIS.....106,115
EPITRIX TUBERIS.....117,118,119,120,121,122,123
ERIOSOMA LANIGERUM.....2
ERYSIPHE GRAMINIS.....278,298,301,304
ERYSIPHE GRAMINIS TRITICI.....279,288,289,290,291,302,309,310,
311,312,313
EUROPEAN CORN BORER.....127,128,129,130,145,146
EUROPEAN RED MITE.....4,8,9,10,11,12,13,14,15,16,17,
18,19,20,21,22,23,24,25,26,27,
28,29,30,31,32,33,38,45,50,51,
56
EUXOA MESSORIA.....131,132,133,137

EVERGESTIS PALLIDATA.....138
EYESPOTTED BUD MOTH.....51
FACE FLY.....165,166,346,348,351,352
FLEA BEETLES.....137
FLETRISSURE VERTICILLIENNE.....241
FOLIAR BLOTCHES.....298,304
FOLIAR DISEASES.....229,231,232,264,265,288,299,300
FOOT DISEASES.....303
FRANKLINIELLA OCCIDENTALIS.....167,168
FRUIT DECAY.....195
FRUIT DISEASES.....231
FRUIT TREE LEAFROLLER.....34
FUSARIUM AVENACEUM.....224
FUSARIUM GRAMINEARUM.....216,224
FUSARIUM NIVALE.....317,318,328,329,331,332,333
FUSARIUM SAMBUCINUM.....235
FUSARIUM SOLANI COERULEUM.....236
FUSARIUM SP.....204,205,209,223,224,243,303
FUSARIUM YELLOWS.....204,205,209,223,224,243,303
GAEUMANNOMYCES GRAMINIS TRITICI.....321,322
GRAPE BERRY MOTH.....63,64
GRASSHOPPERS.....140,141,142,157
GREEN MOLD.....197
GREEN PEACH APHID.....105,109,110,111,112,113,115
GREY SNOW MOLD.....317,318,331
GYMNOSPORANGIUM SP.....200,201
GYPSY MOTH.....171
HAEMATOBIA IRRITANS.....161,162,163,164,165,166,346,348,
351,352
HARD ROT.....197
HOPLOCAMPA SP.....66
HORN FLY.....161,162,163,164,165,166,346,348,
351,352
HORN FLY, RESISTANT.....161
IMPORTED CABBAGEWORM.....78,79,84,85
INSECTS.....67,68,177,178
LACE BUGS.....170
LANZIA SP.....327,330
LATE BLIGHT.....238
LEAF BLOTCH.....269,270,271,272,305,306,307,308
LEAF RUST.....226,262,268,269,270,271,272,273,
274,275,278,280,295,298,304,305,
306,307,308,309,314,315,323,324
LEAFMINERS.....69,70
LEMON YELLOW MITE.....14,15,16,17,18,19,20,21,38,51
LEPTINOTARSA DECEMLINEATA.....94,95,96,97,98,99,100,101,102,
103,104,105,106,107,108,109,113,
134,135,136,179
LEPTOSPHAERIA MACULANS.....203

LIMONIUS AGONUS.....76
LINOGNATHUS VITULI.....159
LONGNOSED CATTLE LOUSE.....159
LONGNOSED SUCKING LOUSE.....159
LOOSE SMUT.....245,246,247,248,249,250,251,276,277,287
LYGOCORIS OMNIVAGUS.....53
LYGUS BUG.....67,68
LYGUS LINEOLARIS.....55,71,72,73,115,116
LYGUS SP.....67,68
LYMANTRIA DISPAR.....171
MACROSIPHUM EUPHORBIAE.....114
MALACOSOMA CALIFORNICUM LUTESCENS.....169
MALADIES DE SEMIS.....303
MALADIES DU PIED.....303
MAMESTRA CONFIGURATA.....82,83
MANDUCA QUINQUEMACULATA.....136
MCDANIEL SPIDER MITE.....10
MEADOW VOLE.....52
MELANOPLUS BIVITTATUS.....139,143,158
MELANOPLUS INFANTILIS.....140,141,142
MELANOPLUS PACKARDII.....140,141,142
MELANOPLUS SANGUINIPES.....139,140,141,142,143,158
MELANOPLUS SP.....157
MELOIDOGYNE HAPLA.....341,343,344
MICRODOCHIUM NIVALE.....317,318,328,329,331
MICROTUS PENNSYLVANICUS.....52
MIGRATORY GRASSHOPPER.....139,140,141,142,143,158
MILDIOU.....238
MIRIDS.....51
MOELLERODISCUS SP.....327,330
MOLD.....195
MONILINIA AMELANCHIERIS.....199,200,201
MONILINIA FRUCTICOLA.....196,198
MONILINIA SP.....197
MOSQUITOES.....349,350
MULLEIN PLANT BUG.....3,4,35,36,38,49,51
MUSCA AUTUMNALIS.....165,166,346,348,351,352
MYCOSPHAERELLA GRAMINICOLA.....288,290
MYRIOSCLEROTINIA BOREALIS.....316,319,320,332,333
MYZUS PERSICAE.....105,109,110,111,112,113,115
NEMATUS VENTRALIS.....172
NET BLOTCH.....252,253,254,255,256,259,260,261,262
NORTHERN CORN ROOTWORM.....147,148,149,150,151,152,153
NORTHERN ROOTKNOT NEMATODE.....341,343,344
OBLIQUEBANDED LEAFROLLER.....49
OIDIUM SP.....337
ONION MAGGOT.....86,87,88,89,90

OPEROPHTERA BRUMATA.....48,49,50,51
ORTHOSIA HIBISCI.....41
OSTRINIA NUBILALIS.....127,128,129,130,145,146
PACKARD GRASSHOPPER.....140,141,142
PALE APPLE LEAFROLLER.....37,48,51
PALE WESTERN CUTWORM.....175,176
PANONYCHUS ULMI.....4,8,9,10,11,12,13,14,15,16,17,
18,19,20,21,22,23,24,25,26,27,
28,29,30,31,32,33,38,45,50,51,
56
PEA APHID.....91,92,93
PEACH TREE BORER.....54
PEAR PSYLLA.....57,58,59
PEAR SAWFLY.....69,70
PEAR SLUG.....69,70
PENICILLIUM ROT.....195
PENICILLIUM SP.....195
PETROBIA LATENS.....144
PHAEOSPHAERIA NODORUM.....288,289,290,293,309
PHOMOPSIS SP.....225
PHYLLONORYCTER BLANCARDELLA.....42,43,44,45,46,47
PHYLLOTRETA CRUCIFERAE.....80,81
PHYLLOTRETA STRIOLATA.....80,81
PHYTOPHAGOUS MITES.....21
PHYTOPHTHORA INFESTANS.....237,238
PHYTOPHTHORA MEGASPERMA GLYCINEA.....222
PHYTOPHTHORA MEGASPERMA SOJAE.....221
PHYTOSEIID MITES.....22,72
PINK EAR ROT.....216
PINK SNOW MOLD.....317,318,328,329,331
PLANT BUGS.....51
PLUTELLA XYLOSTELLA.....79,82,83,85
POD AND STEM BLIGHT.....224
PODOSPHAERA LEUCOTRICHA.....190,191,192,193,194
POTATO APHID.....114
POTATO FLEA BEETLE.....106,115
POTATO LEAFHOPPER.....103,105,115
POWDERY MILDEW.....190,191,192,193,194,278,279,288,
289,290,291,298,301,304,309,310,
311,312,313,337
PRAIRIE TENT CATERPILLAR.....169
PREDACIOUS MITES.....4,15,16,17,18,21,38,51
PSEUDEXENTERA MALI.....37,48,51
PSYLLA PYRICOLA.....57,58,59
PUCCINIA GRAMINIS.....323,324
PUCCINIA GRAMINIS TRITICI.....309
PUCCINIA HORDEI.....262
PUCCINIA RECONDITA.....268,269,270,271,272,273,274,275,
278,280,295,298,302,304,305,306,
307,308,309,314,315

PUCCINIA SORGHI.....226
PUCCINIA STRIIFORMIS.....297
PUCCINIA TRITICINA.....268,269,270,271,272,273,274,275,
278,280,295,298,302,304,305,306,
307,308,309,314,315
PURPLEBACKED CABBAGEWORM.....138
PYRENOPHORA TERES.....252,253,254,255,256,259,260,261,
262
PYRENOPHORA TRICHOSTOMA.....301,314,315,323,324
PYRENOPHORA TRITICI-REPENTIS.....269,270,271,272,282,283,298,304,
305,306,307,308,325
PYTHIUM ROOT DIEBACK.....205,209,215,221
PYTHIUM SP.....205,209,215,221
PYTHIUM ULTIMUM.....204,316,319,320,332,333
QUADRASPIDIOTUS PERNICIOSUS.....39,40
RHAGOLETIS MENDAX.....60,61,62
RHIZOCTONIA BULB ROT.....223
RHIZOCTONIA SOLANI.....204,205,206,207,208,209,239,303
RHIZOCTONIA SP.....223
RHIZOPUS FRUIT ROT.....198
RHIZOPUS NIGRICANS.....198
RHIZOPUS SP.....198
RHYNCHOSPORIUM SECALIS.....256,257,258,259,260,261
ROOT ROT.....206,207,208,221,223
ROOT-LESION NEMATODE.....342
ROSY APPLE APHID.....38
ROUILLE DES FEUILLES.....298,304
RUST.....201
SAN JOSE SCALE.....39,40
SAWFLIES.....65,67,68,69,70,199
SCAB.....181,182,183,184,185,186,187,188
SCALD.....256,257,258,259,260,261
SCLEROTINIA BOREALIS.....316,319,320,332,333
SCLEROTINIA HOMEOCARPA.....330
SCLEROTINIA SCLEROTIORUM.....210,211,212,218,220,233
SCLEROTINIA STEM ROT.....210,211,212,218
SCLEROTIUM CEPIVORUM.....219
SEED DISEASE.....303
SEED ROT.....225
SEEDCORN MAGGOT.....77,156
SEEDLING BLIGHT.....205,209,225
SEEDLING DISEASES.....209
SEPTORIA.....261,269,270,271,272,281,296,301,
305,306,307,308,314,315
SEPTORIA LEAF AND GLUME BLOTCH.....280,292
SEPTORIA LEAF BLOTCH.....261,273,274,275,278,310,311
SEPTORIA LEAF SPOT.....230,231,232,262,294,295,312,313
SEPTORIA LYCOPERSICI.....230,231,232
SEPTORIA NODORUM.....280,292,298,304,310,311

SEPTORIA NODORUM BLOTCH.....288,289,290,293,309
SEPTORIA PASSERINII.....262
SEPTORIA SP.....261,269,270,271,272,281,296,301,
305,306,307,308,314,315
SEPTORIA TRITICI.....273,274,275,278,294,295,312,313
SEPTORIA TRITICI BLOTCH.....288,290
SIMULIUM LUGGERI.....160
SIMULIUM MERIDIONALE.....160
SIMULIUM VITTATUM.....160
SNOW MOLD.....316,319,332,333
SPECKLED GREEN FRUITWORM.....41
SPECKLED LEAF BLOTCH.....288,290
SPILONOTA OCELLANA.....51
SPOT BLOTCH.....258,263
SPOTTED TENTIFORM LEAFMINER.....42,43,44,45,46,47
STEM CANKER.....225
STEM RUST.....309
STORAGE MOLD.....338,339,340
STRAWBERRY BUD WEEVIL.....73
STRIPE RUST.....297
STRIPED BLACK FLY.....160
STRIPED FLEA BEETLE.....80,81
SYNANTHEDON EXITIOSA.....54
TABANIDS.....349,350
TACHES FOLIAIRES.....298,304
TAKE-ALL.....321,322
TAN SPOT.....269,270,271,272,282,283,301,305,
306,307,308,314,315,323,324,325
TARNISHED PLANT BUG.....55,71,72,73,115,116
TETRANYCHUS MACDANIELI.....10
TETRANYCHUS URTICAE.....25,26,29,30,31,32,33,45,72
THRIPS.....67,68,69,70
TILLETIA CARIES.....266,267,284,285
TILLETIA FOETIDA.....285
TOMATO HORNWORM.....136
TUBER FLEA BEETLE.....117,118,119,120,121,122,123
TURKEY GNAT.....160
TWOSPOTTED SPIDER MITE.....25,26,29,30,31,32,33,45,72
TWOSTRIPED GRASSHOPPER.....143,158
TYPHLODROMUS OCCIDENTALIS.....10
TYPHLODROMUS PYRI.....50
TYPHLODROMUS SP.....4,15,16,17,18,21,38,51
TYPHULA ISHIKARIENSIS.....331
TYPHULA ISHIKARIENSIS CANADENSIS.....332,333
TYPHULA ISHIKARIENSIS INCARNATA.....317,318
USTILAGO AVENAE.....287
USTILAGO HORDEI.....244
USTILAGO NUDA.....245,246,247,248,249,250,251
USTILAGO TRITICI.....276,277,287

VENTURIA INAEQUALIS.....181,182,183,184,185,186,187,188
VERTICILLIUM ALBO-ATRUM.....240,241
VERTICILLIUM WILT.....241
WESTERN CORN ROOTWORM.....147,149,150,151,152,153,155
WESTERN FLOWER THRIPS.....167,168
WESTERN PREDATORY MITE.....10
WHITE MOLD.....220
WHITE ROT.....219
WILLOW SAWFLY.....172
WINTER MOTH.....48,49,50,51
WOOLLY APPLE APHID.....2
YELLOWSTRIPED GRASSHOPPER.....139,143,158
ZETZELLIA MALI.....14,15,16,17,18,19,20,21,38,51

HOST INDEX

ACUTE WILLOW.....172
AGROPYRON CRISTATUM.....141,142
AGROSTIS STOLONIFERA.....327,329,330,331,332,333
ALFALFA.....139,141,142
ALLIUM CEPA.....86,87,88,89,90,219
AMELANCHIER ALNIFOLIA.....65,66,67,68,69,70,71,199,200,201
ANNUAL BLUE GRASS.....327,328,329
APIUM GRAVEOLENS.....358
APPLE.....1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,181,182,183,184,185,186,187,188,189,190,191,192,193,194,195
APPLE TREE.....52
APRICOT.....196
ASPARAGUS.....75,345
ASPARAGUS OFFICINALIS.....75,345
AVENA SATIVA.....287
BARLEY.....144,243,244,245,246,247,248,249,250,251,252,253,254,255,256,257,258,259,260,261,262,263,264,265
BEAN.....76
BEEF CATTLE.....159,163,166,346,348
BIRD'S RAPE.....213
BLE D'AUTOMNE.....303,304
BLE DE PRINTEMPS.....298
BOS SP.....159,163,166,346,348
BRASSICA CAMPESTRIS.....213
BRASSICA NAPOBRASSICA.....124,125,126
BRASSICA NAPUS.....80,81,82,83,203,204,205,206,207,208,209,210,211,212,213
BRASSICA OLERACEA BOTRYTIS.....84,85
BRASSICA OLERACEA CAPITATA.....78,79
BRASSICA RAPA RAPIFERA.....138
CABBAGE.....78,79
CANARY GRASS.....354,355
CANOLA.....80,81,82,83,203,205,206,207,208,209,210,211,212,213
CARROT.....215,341,356,357
CATTLE.....160,161,162,164,165,349,350,353
CAULIFLOWER.....84,85
CELERY.....358

CHERRY.....197
CHOKECHERRY.....169
CHRYSANTHEMUM.....167
CHRYSANTHEMUM SP.....167
CISSUS RHOMBIFOLIA.....334,335,336,337
COLORADO SPRUCE.....339,340
COMMON WHEAT.....296,297,298,301,302,303,304,305,
307,308,309,310,311,312,313,314,
315,316,317,318,319,320,321,322,
323,324,325
CORN.....150,151,152,153
COTONEASTER.....170
COTONEASTER SP.....170
CRANBERRY.....359
CREEPING BENT GRASS.....327,329,330,331,332,333
CREEPING RED FESCUE.....332
CRESTED WHEAT GRASS.....141,142
DAUCUS CAROTA.....215,341,356,357
DRY PEA.....220
EASTERN COTTONWOOD.....338
EGGPLANT.....360
FESTUCA RUBRA.....332
FIELD CORN.....145,146,147,148,149,155,216
FIELD PEA.....91,92,93,220
FIELD TOMATO.....227,228,229,230,231,232
FLUE-CURED TOBACCO.....131,132,133
FRAGARIA VIRGINIANA.....72,73,363
GARDEN LETTUCE.....358,361,362
GLYCINE MAX.....156,221,222,223,224,225
GRAPE.....63,64
GRAPE IVY.....334,335,336
GRASSES.....139,143
GREENHOUSE ORNAMENTALS.....168
HORDEUM SP.....144,243,244,245,246,247,248,249,
250,251,252,253,254,255,256,257,
258,259,260,261,262,263
HORDEUM VULGARE.....264,265
HORTICULTURAL CROPS.....177,178
KENTUCKY BLUE GRASS.....332
LACTUCA SATIVA.....358,361,362
LENS CULINARIS.....217,218
LENTIL.....217,218
LETTUCE.....358,361,362
LOWBUSH BLUEBERRY.....60,61,62
LYCOPERSICON ESCULENTUM.....134,135,136,137,227,228,229,230,
231,232,343,344
MALUS SP.....1,2,3,4,5,6,7,8,9,10,11,12,13,
14,15,16,17,18,19,20,21,22,23,
24,25,26,27,28,29,30,31,32,33,

MALUS SP.....34,35,36,37,38,39,40,41,42,43,
44,45,46,47,48,49,50,51,52,181,
182,183,184,185,186,187,188,189,
190,191,192,193,194,195
MEDICAGO SATIVA.....139,141,142
MILK.....351,352
NATIVE PASTURE.....143
NICOTIANA TABACUM.....131,132,133
OAK.....171
OAK-LEAF IVY.....334,335,336,337
OAT.....287
ONION.....86,87,88,89,90,219
ORNAMENTALS.....168
PASTURE.....140,141
PEACH.....53,54,55,198
PEAR.....56,57,58,59
PHALARIS CANARIENSIS.....354,355
PHASEOLUS COCCINEUS.....77
PICEA PUNGENS.....339,340
PISUM SATIVUM ARVENSE.....91,92,93,220
POA ANNUA.....327,328,329
POA PRATENSIS.....332
POMME DE TERRE.....95,96,97,98,99,100,238,241
POMMIER.....52
POPULUS DELTOIDES.....338
POTATO.....94,95,96,97,98,99,100,101,102,
103,104,105,106,107,108,109,110,
111,112,113,114,115,116,117,118,
119,120,121,122,123,179,235,236,
237,238,239,240,241
PROCESSING TOMATO.....134
PRUNUS ARMENIACA.....196
PRUNUS PERSICA.....53,54,55,198
PRUNUS SP.....197
PRUNUS VIRGIANA.....169
PYRUS COMMUNIS.....56,57,58,59
QUERCUS SP.....171
RAPESEED.....204
RASPBERRY.....342
RED FESCUE.....332
RIVER.....160
RUBUS IDAEUS.....342
RUTABAGA.....124,125,126
SALIX ACUTIFOLIA.....172
SASKATOON-BERRY.....65,66,67,68,69,70,71,199,200,
201
SCARLET RUNNER BEAN.....77
SEED CORN.....151,152,153
SOFT WHITE SPRING WHEAT.....296,297,301,302

SOIL.....174
SOLANUM MELONGENA ESCULENTUM.....360
SOLANUM TUBEROSUM.....94,95,96,97,98,99,100,101,102,
103,104,105,106,107,108,109,110,
111,112,113,114,115,116,117,118,
119,120,121,122,123,179,235,236,
237,238,239,240,241
SOYBEAN.....156,221,222,223,224,225
SPRING BARLEY.....264,265
SPRING WHEAT.....157,158,284,285,286,287,288,289,
290,291,292,293,294,295,299,300
STRAWBERRY.....72,73,363
STUBBLE TURNIP.....138
SWEET CORN.....127,128,129,130,226
TOBACCO.....131,132,133
TOMATO.....134,135,136,137,227,228,229,230,
231,232,343,344
TRITICUM AESTIVUM.....296,297,298,301,302,303,304,305,
307,308,309,310,311,312,313,314,
315,316,317,318,319,320,321,322,
323,324,325
TRITICUM SP.....157,158,266,267,268,269,270,271,
272,273,274,275,276,277,278,279,
280,281,282,283,284,285,286,287,
288,289,290,291,292,293,294,295,
299,300,306,364
TURF.....332,333
TURNIP.....138
VACCINIUM ANGUSTIFOLIUM.....60,61,62
VACCINIUM SP.....359
VENEZUELA TREEBINE.....334,335,336,337
VITIS SP.....63,64
WALKER POPLAR.....338
WHEAT.....157,158,266,267,268,269,270,271,
272,273,274,275,276,277,278,279,
280,281,282,283,284,285,286,287,
288,289,290,291,292,293,294,295,
299,300,306,364
WINTER WHEAT.....305,307,308,309,310,311,312,313,
314,315,316,317,318,319,320,321,
322,323,324,325
ZEA MAYS.....145,146,147,148,149,150,151,152,
153,155,216
ZEA MAYS RUGOSA.....127,128,129,130,226

AUTHOR INDEX

ALLEN F T.....334,335,336,337
ANDERSON T R.....222
ANDREWS R C.....140,141
ANGERILLI N P D.....8,9,39
BANHAM F L.....54
BEATTIE B.....147
BELAIR G.....341,342,343,344
BELCHER K W.....161
BELL K G.....282,283
BLYDORP L J.....258,263,288,289,290,293,309
BOITEAU G.....94
BOUCHARD C.....52
BRACKEN G K.....124
BRAUN H E.....345,346,348,351,352,356,357,358,
360,361
BRAUNBERGER P G.....11,12,13
BROADBENT A B.....167,168
BRODEUR J.....298,303,304
BUCKLEY H.....285
BURPEE L L.....317,318,330,331
BYERS J R.....144,175,176
CHARNETSKI W A.....144
CHENG H H.....131,132,133,137
CHEVERIE F G.....253
CLEMENTS S J.....359,363
COLE K J.....53
COLWELL D D.....161
CONNER R L.....302
COOK J M.....33,46,47,188
COSSENTINE J E.....5,34,41,54
COUTURE L.....287
CROWE-SWORDS P R.....161
CROZIER L.....61,62
DAVIDSON J G N.....65,66,67,68,69,70,71,199,200,
201,204,248,316,319,320,332,333
DEKRUYFF J.....194
DENTZ C B.....263,288,289,290,293,309
DEVAUX A.....298,303,304
DOBSON C.....84
DOELL R J.....269,270,271,272,305,306,307,308
DOUGLAS R G.....157
DREXLER D.....84
DUCHESNE R-M.....95,96,97,98,99,100
DUCZEK L J.....264,265,286,299,300
DUMAINE L C.....10,56,190,191,192

DUNPHY J C.....94
DYCK V A.....6
DZIADYK D A.....264,265,299,300
EDGINGTON L V.....215,219,247
ELLIS C R.....147
ENTZ P J.....11,12,13
ESTABROOKS E.....60
EYOLFSON A K.....142,245,266
FISHER P.....35
FITZGIBBON F.....8,9,39
FLANNIGAN G.....159,166,346,348,351,352
FOURNIER Y.....341,342,343,344
FRANK R.....345,356,357,358,360,361,362
GALLOWAY T D.....162,163,164
GAUDET D A.....285
GAUL S.....61,62
GIBB W B.....246,268,284
GOULTY L G.....318,330,331
GUGEL R K.....206,212,213
HALL R.....225
HAN DEYUAN.....364
HANLON J J.....131,132,133,137
HARDMAN J M.....3,4,7,14,15,16,17,18,19,20,21,
37,38,42,48,49,50,51
HATFIELD J G.....10,56,190,191,192
HEPBURN J E.....27,28,31,32
HERBUT M J.....349,350
HILL B D.....173,174,175,176
HOLM F A.....257
HOWARD R J.....69,70,200,201,220,334,335,336,
337
HUMPHRIES B.....349,350
INABA D J.....173,174
IVERSON A T.....314,315
JAQUES R P.....101,134
JENSEN L B M.....5,34,41,54
JOHNS S W.....312,313
JOHNSON D L.....140,141,142
JOHNSTON H W.....292,310,311
JONG C.....36,58,59
JOTCHAM J R.....29,30,181,182
KAMINSKI D A.....211
KELLY R F.....167,168
KENNEY H L.....312,313
KHARBANDA P D.....205,209,218,243,248,252,280,286
KINDRACHUK C R.....264,265,299,300
KNIBBE E.....87
KRAMER J.....285
KUMAR Y.....349,350

KUNELIUS H T.....138
KUZYK A D.....302
KVEDER T.....142
LABUN T J.....256
LAING D R.....101
LAPLANTE R.....238,241
LAWTON M B.....317,318
LETENDRE G.....1,114,148
LOCKHART C L.....21,183
LUND J E.....106,107,108
MACKENZIE J R.....88,89,90,110,111,112,117,118,
119,120,121,122,123
MARSHALL D B.....2,22,23,35,40,43,44,45,53,57,
72
MARTIN R A.....247,253,254,276
MASON P G.....160
MATTHEW E L.....296,297
MCCARTNEY D H.....353
MCCURDY S L.....286
MCDONALD I D.....102,135
MCDONALD M R.....215
MCEWEN F L.....86,87,345,356,357,358,360,361,
362
MCFADDEN G A.....126
MCGRAW R R.....75,78,81,104,116
MCINNES D.....255
MCIVER S.....86,87,345,356,357,358,360,361,
362
MCKENZIE D L.....203,206,207,208,212,213
MCLEAR M.....171,327,328,329
MCMULLEN R D.....24,36,58,59
MCNAUGHT J R.....256
MELLISH D.....292
MILLIGAN B.....140
MOONS B.....91,92,250
MORRALL R A A.....210,211,212,217,233
MORRY H G.....125
MORTON J.....127,128,184
MOSKALUK E R.....69,70,200,201,220,334,335,336,
337
MWANGALA F S.....163,164
NEIGHBOUR S A.....65,67,68,199
NEILL G B.....169,170,172,338,339,340
NEILSON W.....60,61,62
NEWBERY R J.....183
NIELSEN J J.....287
ORR D D.....243,248
OWEN G.....195

PALMER D P.....115
PALMER R.....193
PARTYKA E F.....82,83,93,143,158,251,257,277
PAVLIKOVA E.....140,141
PERRYMAN M E.....149
PHILIP H G.....349,350
PHILIPP O.....281
PIENING L J.....287
PITBLADO R E.....103,129,130,226,227,228,229,230,231,232
PLATT H W.....235,236,237,239,240
POLAND C M.....165
POLIQUIN B.....25,26,185,186
PREE D J.....2,22,23,35,40,43,44,45,53,57,72
PROUDFOOT K G.....125
PUCHALSKI B J.....285
PURDY J.....165,346
RANCOURT B.....73
RAWORTH D A.....363
REDMOND S G.....27,28,31,32
REICHLE R A.....353,354,355
REYNARD D A.....169,170,172,338,339,340
RIPLEY B.....215,362
RITCEY G.....86,87,345,356,357,358,360,361,362
ROGERS R E L.....29,30,181,182
ROURKE D R S.....80,139,269,270,271,272,305,306,307,308
RUDE S V.....211,212
RUSSELL R C.....246,268,284
SCHAAD M C.....273,274,275,278
SCHAAFSMA A W.....145,146,151,152,153,155,156,216,223,224
SEARS M K.....75,78,81,104,116
SHOLBERG P L.....187,193,195,196,197,198
SLOPEK S W.....243,248,259,260,261
SMITH D B.....63,64,76,77,105,113,115,136,149,150,221,244,249,279
SMITH E.....189
STEWART J G.....79,85,106,107,108,138
STOBBE E H.....314,315
STRACHAN J.....162
SURGEONER G A.....159,166,346,348,351,352
SUTTON J C.....291,321,322
SZETO S.....359,363
SZLANSKI A.....162
TARTIER L.....238,241
TEO B K.....233

THOMPSON L S.....79,85,106,107,108
THOMSON D A.....11,12,13,39
THOMSON M.....142
TOLMAN J H.....126
TOLTON D A.....258,263,288,289,290,293,309
TU C M.....177,178
TURCOTTE D.....25,26,185,186
TUREK R.....291,321,322
TURKINGTON T K.....211,212
TURNBULL G.....205,209,218,252,280,286
TURNBULL S A.....179
UTKHEDE R S.....189
VALDES E.....219
VALK M.....87
VAUGHN F C.....165
VERMA P R.....203,206,207,208,210,212,213,233
VERNON R S.....88,89,90,110,111,112,117,118,
119,120,121,122,123
VINCENT C.....73
WALKER D.....292
WALLACE T D.....301
WARKENTIN T D.....262,294,295,323,324
WARNER J.....33,46,47,188
WELACKY T W.....222
WESOLOWSKI M.....187
WESTCOTT N D.....353,354,355,364
WESTWOOD A R.....325
WILLICK J L.....142,296,297,301
WISE I L.....157
WOERLEN T.....55,109
WRIGHT E B.....262,294,295,323,324
WRIGHT L P.....140,141
XUE G.....225
YORSTON J M.....194
ZANDSTRA J W.....63,64,76,136
ZIRK E B.....267

ESTABLISHMENT INDEX

AG-QUEST
MINTO MANITOBA.....80,139,269,270,271,272,305,306,307,308

AGRICULTURE CANADA
BEAVERLODGE ALBERTA.....65,66,67,68,69,70,71,199,200,201,204,248,316,319,320,332,333

AGRICULTURE CANADA
CHARLOTTETOWN PRINCE EDWARD ISLAND.....79,85,106,107,108,138,235,236,237,239,240,247,253,254,276,292,310,311

AGRICULTURE CANADA
DELHI ONTARIO.....131,132,133,137

AGRICULTURE CANADA
FREDERICTON NEW BRUNSWICK.....60,94

AGRICULTURE CANADA
HARROW ONTARIO.....101,134,222

AGRICULTURE CANADA
INDIAN HEAD SASKATCHEWAN.....338,339,340

AGRICULTURE CANADA
KENTVILLE NOVA SCOTIA.....3,4,7,14,15,16,17,18,19,20,21,37,38,42,48,49,50,51,60,61,62,183

AGRICULTURE CANADA
LACOMBE ALBERTA.....243,248,287

AGRICULTURE CANADA
LETHBRIDGE ALBERTA.....140,141,142,144,161,173,174,175,176,285,302

AGRICULTURE CANADA
LONDON ONTARIO.....126,177,178,179

AGRICULTURE CANADA
MELFORT SASKATCHEWAN.....353

AGRICULTURE CANADA
P.F.R.A. INDIAN HEAD SASKATCHEWAN.....169,170,172

AGRICULTURE CANADA
SASKATOON SASKATCHEWAN.....160,203,206,207,208,210,212,213,233,264,265,285,286,299,300,353,354,355,364

AGRICULTURE CANADA
ST-JEAN-SUR-RICHELIEU QUEBEC.....73,341,342,343,344

AGRICULTURE CANADA
ST. JOHN'S NEWFOUNDLAND.....125

AGRICULTURE CANADA
STE-FOY QUEBEC.....287

AGRICULTURE CANADA
SUMMERLAND BRITISH COLUMBIA.....5,6,8,9,24,34,36,39,41,54,58,59,187,189,193,195,196,197,198

AGRICULTURE CANADA
TRENTON ONTARIO.....33,46,47,188
AGRICULTURE CANADA
VANCOUVER BRITISH COLUMBIA.....88,89,90,110,111,112,117,118,
119,120,121,122,123,359,363
AGRICULTURE CANADA
VINELAND STATION ONTARIO.....2,22,23,35,40,43,44,45,53,57,
72,167,168
AGRICULTURE CANADA
WINNIPEG MANITOBA.....124,287
AGRIPROGRESS
THORNHILL MANITOBA.....281
ALBERTA AGRICULTURE
OLDS ALBERTA.....243,248,259,260,261
ALBERTA ENVIRONMENTAL CENTRE
VEGREVILLE ALBERTA.....205,209,218,243,248,252,280,286,
349,350
ALBERTA SPECIAL CROPS AND
HORTICULTURAL RESEARCH CENTRE
BROOKS ALBERTA.....69,70,200,201,220,334,335,336,
337
B C MIN OF AGRICULTURE AND FISHERIES
KELOWNA BRITISH COLUMBIA.....194
BASF CANADA INC
BRANDON MANITOBA.....282,283
BASF CANADA INC
REXDALE ONTARIO.....255,273,274,275,278
CHEMAGRO LIMITED
MISSISSAUGA ONTARIO.....258,263,288,289,290,293,309
CHEMAGRO LIMITED
RED DEER ALBERTA.....142
CHEMAGRO LIMITED
WINNIPEG MANITOBA.....245,246,266,267,268,284
CHIPMAN INC
LONGUEUIL QUEBEC.....1,114,148
CHIPMAN INC
SASKATOON SASKATCHEWAN.....82,83,93,143,158,251,277
CHIPMAN INC
STONEY CREEK ONTARIO.....55,63,64,76,77,105,109,113,115,
136,149,150,171,221,244,249,279,
327,328,329
CHIPMAN INC
WINNIPEG MANITOBA.....91,92,250
CIBA-GEIGY CANADA LTD
CALGARY ALBERTA.....142,256,296,297,301
CIBA-GEIGY CANADA LTD
CAMBRIDGE ONTARIO.....165,312,313,346
CIBA-GEIGY CANADA LTD
KELOWNA BRITISH COLUMBIA.....194

COOPERS AGROPHARM INC
AJAX ONTARIO.....161
DOW CHEMICAL CANADA INC
SARNIA ONTARIO.....11,12,13
DUPONT CANADA AGRICULTURAL PRODUCTS
GUELPH ONTARIO.....31,32
DUPONT CANADA AGRICULTURAL PRODUCTS
LONDON ONTARIO.....27,28
DUPONT CANADA AGRICULTURAL PRODUCTS
MISSISSAUGA ONTARIO.....10,56,190,191,192
DUPONT CANADA INC
MONTREAL QUEBEC.....25,26,185,186
HOECHST CANADA INC
CAMBRIDGE ONTARIO.....102,135
HOECHST CANADA INC
REGINA SASKATCHEWAN.....157
HOECHST CANADA INC
WINNIPEG MANITOBA.....84
ICMS INC
PORTAGE LA PRAIRIE MANITOBA.....262,294,295,323,324
KEMPTVILLE COLLEGE OF
AGRICULTURAL TECHNOLOGY
KEMPTVILLE ONTARIO.....127,128,184
MARBICON BIOLOGICAL CONSULTANTS
BERWICK NOVA SCOTIA.....29,30,181,182
MIN DE L'AGRICULTURE PECHERIES
ET L'ALIMENTATION
ST-HYACINTHE QUEBEC.....238,241,298,303,304
MIN DE L'AGRICULTURE PECHERIES
ET L'ALIMENTATION
STE-FOY QUEBEC.....52,95,96,97,98,99,100
NEW BRUNSWICK DEPT. OF AGRICULTURE
AND RURAL DEVELOPMENT
FREDERICTON NEW BRUNSWICK.....292
NOVA SCOTIA DEPT. OF AGRICULTURE
AND MARKETING
TRURO NOVA SCOTIA.....61,62,292
ONTARIO MIN OF
AGRICULTURE AND FOOD
KETTLEBY ONTARIO.....87
ONTARIO MIN OF
AGRICULTURE AND FOOD
SIMCOE ONTARIO.....35
RIDGETOWN COLLEGE OF
AGRICULTURAL TECHNOLOGY
RIDGETOWN ONTARIO.....103,129,130,145,146,151,152,153,
155,156,216,223,224,226,227,228,
229,230,231,232

ROHM AND HAAS CANADA INC
WINNIPEG MANITOBA.....325
UNION CARBIDE AGRICULTURAL PRODUCTS LTD
CALGARY ALBERTA.....140
UNIVERSITY OF GUELPH
GUELPH ONTARIO.....75,78,81,86,87,104,116,147,159,
166,215,219,225,247,291,317,318,
321,322,330,331,345,346,348,351,
352,356,357,358,360,361,362
UNIVERSITY OF MANITOBA
WINNIPEG MANITOBA.....162,163,164,314,315
UNIVERSITY OF SASKATCHEWAN
SASKATOON SASKATCHEWAN.....210,211,212,217,233,257